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30 September 1982 Vol 1 No 24

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All current programs require 165K minimum Ram. Please state Spectrum or ZX81 versions required. Cassettes £4.95 each or £8 any two. Prices include p & p.

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### How to submit articles

Articles which are submitted for publication should not be more than 1000 words long.

All submissions should be typed and a double space should be left between each line.

Programs should, whenever possible, be computer printed.

At present we cannot guarantee to return every submitted article, so please keep a copy.

### Accuracy

*Popular Computing Weekly* cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

## This Week



Cover illustration by Teoman Inmaz

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## Editorial

Adventure games have a small but devoted following among micro-computer users.

Go to any micro exhibition and you will find a few intent individuals, oblivious to the noise of the surrounding *Space Invader* stalls, earnestly discussing the merits of their latest Adventure. Not for them the tests of co-ordination and reflex demanded by *Asteroids* and *Defender*. They are living in another world, literally.

Adventure games are a curious mix of puzzle and fantasy. The protagonist finds him, or her, self in a world that can range from Tolkien's *Lord of the Rings* to Clarke's *2001 A Space Odyssey*. The object of the game is usually to find some hidden treasure or rescue an imperilled princess.

It is essentially a battle of wits — the player versus the author of the program. But, though adventure writers can be pretty devious, the clues to solving the game are usually there, if you look hard enough.

There is a feeling of tremendous satisfaction in solving an Adventure, or even part of one. It is a feeling that is deserved, since your success depends on your native wit, or your ability to cheat by looking through the program listing.

## Next Week



Can you drive your opponent into a corner? Find out in *Laserchase* — a new game for ZX Spectrum

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# Sinclair hopes to clear backlog

SINCLAIR Research remains confident that it will clear its Spectrum order backlog by the middle of October. This claim is made despite still lengthening delivery times.

Only about 25,000 of the 40,000 orders for the new machine have so far been fulfilled. Many customers for the 48K version have now waited longer than the 12-week delivery promised by Clive Sinclair in August.

A spokesman for Sinclair Research explained that most problems concern the 48K and

that delivery of the 16K is now down to 10 weeks.

Graham Tillman at Jaeserv, Sinclair's mail order company in Camberley, admitted the difficulties. "We were getting a 50 percent rejection rate for the 48K machines at quality control" he said.

"Design of the Ram expansion board caused problems. It has very fine tracks prone to breaking and shorting."

When the Spectrum printed-circuit board was redesigned by Timex in Portugal to correct initial design problems, the

opportunity was taken to incorporate the Ram expansion circuit into the main board. The Ram expansion now has 12 Ram chips which plug individually into sockets on the main board.

Stewart Crookshank, Production Manager of Timex Dundee says: "Production is increased with the new boards and we seem to have sorted out the problems. Some of the old boards are still going out (as 16K machines) but there will be no problems with upgrading."

Graham Tillman confirms that the first sizeable delivery of new 48K machines has been received at Camberley. He says: "We are confident of delivering a reasonable number of 48K models each week."

## Sinclair boosts school micros

MICROCOMPUTING in primary education is given a £15m boost in a scheme announced by Sinclair Research.

Under the offer schools taking advantage of the government's 'Micros in Primaries' grants to buy a ZX Spectrum microcomputer will receive additional help from Sinclair.

Each of the country's 27,000 primary schools that chooses the Spectrum under the government scheme will also get a free ZX printer, Logo educational language and ten discount vouchers. Vouchers, worth a £45 discount or printer, may be used with further Spectrum purchases — one voucher per machine.

Clive Sinclair said: "Giving one computer to a school is a marvellous initiative. One computer per child is better than one per class, and our scheme will encourage a move in this direction."

## Software by cable tv

A CABLE television network, that will enable tv owners to access a vast database of software, could be in operation by 1985.

Such a system of software distribution was proposed by Kenneth Baker, the Information Technology Minister, speaking at the Edinburgh Festival tv conference. He said that a 30-channel system could be installed in half the country's homes in time for the introduction of direct satellite broadcasting early in 1986.

Decisions on the future of cable tv will be taken this autumn, based on the recommendations of the Hunt Inquiry — due to produce its report by the end of September. If cable tv gets the go-ahead the first networks could be licenced in 1983. The estimated £2½bn cost of the cable tv network would be raised through private enterprise.

## More programs for NewBrain

GRUNDY Business systems has launched a range of software to support its NewBrain micro.

French and German teaching and card index packages cost £4.95. A home-finance package and three games — Tycoon, Quadrox and Space Battle all cost £9.95. A range of business programs including a mailing list package and a monthly accounts package cost £25.95.



Epson's HX-20 portable micro has 16K Ram and a 20X4 liquid crystal display.

## Epson (UK) to launch HX20 in November

EPSON (UK) launch a new portable microcomputer, the HX-20, in mid-November.

A compact unit weighing just over 3½lbs, it incorporates a true full-size keyboard, 16K Ram, dot-programmable 20 character × 4 line liquid crystal display (lcd), 24 column dot-matrix printer, microcassette drive and 50h Ni-Cad battery power supply. An adaptor allows mains operation.

The HX-20 runs the full range of Microsoft Basic commands and when connected to an external monitor will display colour. Memory space is divided into 5 partitions (with a sixth for assembler programs) accessed using a Login command. The lcd display can be used to view any portion of a virtual screen of up to 255 character width. The cassette drive is controlled from the keyboard using the Wind command.

The HX-20 has both RS232C and serial interfaces; the cassette drive uncups and can be replaced by a plug-in Rom cartridge. An expansion box can be attached to the left-hand side giving an additional 16K Ram and 16K Rom. There is also an 8K Rom slot underneath the machine for assembler programs.

Launch of the HX-20 will be at the Compek UK show on November 16 to 19. A desktop version is being planned, to feature a built-in monitor and 5¼ inch disc drives.

Dan Diehlmann, Epson's Sales Manager said "The HX-20 should go like a rocket. It marks the beginning, by Epson, of a long-term commitment to the manufacture of microcomputers." Complete with printer, micro-cassette drive and mains adaptor, the HX-20 costs £479, plus VAT. The expansion box costs £80 plus VAT.

## Competition winner



**BRAIN OF BRITAIN:** When Phillip Brain, winner of Popular Computing Weekly's Programming Award Scheme, gets his Spectrum prize it will be the first micro he has owned. He borrowed from a friend the ZX81 on which he developed his winning entry, Odyssey. Phillip is 21 and since leaving school had until recently been unemployed. He is now a member of one of Sheffield's thriving rock bands. He said: "It was the first machine-code program I wrote. It was a friend who insisted that I enter it in the competition."

# POPULAR Computing WEEKLY

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# Letters

write to Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2

## Screens—null string

When my ZX Spectrum finally arrived, I busied myself with trying to understand the wealth of commands (to a former ZX80 user), and not least how to get them out of the keyboard. In the end I reached the display file, which is arranged so horribly that the manual advises anyone to use *Print* at in place of *Poke*, and *Screens* in place of *Peek*.

In fact, the manual is very reticent about how *Screens* works — you have to search through Appendix C. The reason becomes clear when you start using it — although *Screens* will return the character at the specified line and column when its code lies between 32 and 127, it returns a null string for all graphics characters, including any user-defined graphics.

Now this seems to me to be rather a serious drawback in the command; surely it is in precisely the sort of situation that one would use user-defined graphics that one would need some way of checking the display — take any *Invaders*-type program, for instance?

On discovering this, my initial reaction (after fury, disbelief, muttered curses) was to get round the problem using *Over*.

If *Screens* returned a null string, the routine would print the graphics characters one by one over the relevant position, and then use *Screens* to check if the result was a space, in which case it was the correct character.

This, however, had two snags. It was fairly slow (up to a second or so), and it looked a little bit messy on the screen during execution. This latter effort is much better:

```
100 LET I=CODE SCREENS(Y,X):
IF I THEN RETURN
110 POKE 23006, PEEK 23675:
POKE 23007, PEEK 23676-1
120 LET I=CODE SCREENS
(Y,X)+112
130 POKE 23006,0: POKE 23007,0:
RETURN
```

Before calling the sub-routine you must define Y and X, the column and line positions of the spot you are checking. It works by temporarily making the Spectrum think the character set starts where the user-defined

graphics are located.

The disadvantage is that this does not recognise the pre-defined graphics, codes 129-142, returning 1=112 for all of them. However, these are such miserable graphics anyway, included more for ZX81 compatibility than for any innate value I should think, that this is not much of a handicap.

Hope this is helpful. My thanks to Sam Goodwin (*Popular Computing Weekly*, August 5) for the first article I've seen to tell Spectrum owners something they couldn't have read in the manual.

Dominic Ferard  
Sunningdale House  
Raby Road  
Stockton-on-Tees  
Cleveland

## Reviews unfair to Vic20

Why are your Vic20 program reviews almost always bad? The worst yet must surely be on the *Vicpendium 1*, by OPUS 2 software. I have had this cassette for three weeks and find it very enjoyable. Gorgon's Tomb plays well, even if it is based on a maze. Their *Othello* is not easily beaten — as they say, you have to keep your wits about you, for it plays a subversive game and will suddenly turn the tables on you. *Digitman* does not seem to do anything wrong, the error trapping seems quite good to me.

But it is the *Invaders* comment where you really show yourselves up. It is certainly not slow, especially at the end, and the 'oval blobs' you mention are very obviously not oval blobs at all, but well defined 'alien' characters.

Come on, *Popular Computing Weekly*. ZX's are not the only programs, nor the only computers in the world. What about admitting you might be wrong, for once?

P E Bagley  
33 Coldbeck  
Waltham Abbey  
Essex EN9 1UR

We have never claimed to be infallible. We do make some mistakes, though we make every effort to avoid them.

However, software reviews depend largely on the taste of the reviewer. What appeals to one reviewer may repel

another and vice versa. Boris Allan, who reviewed *Vicpendium 1*, was not impressed and felt it was heavily over-priced.

But, I am glad to report that T P Watts of Opus 2 Software has dropped the price of *Vicpendium 1* by £1 from £7.95 to £6.95. The *Invaders* program, which was written in Basic on the version we reviewed, has subsequently been rewritten in machine code.

Mr Watts also felt that we had been unfair in our review of *Vicpendium 1*. Perhaps other readers would like to add their comments?

## Spectrum bug found

R e Ian Logan's "Spectrum bugs wanted". Try this: either *Cls:Print Chr\$ 8; "8"* or *Print at 0,0; Chr\$ 8;"8"* will print a graphics shift-8 blob midway down the right side of the screen, and overwrite part of a program (one byte).

Dilwyn Jones  
Fodol Farm  
Hafod Lane  
Caernarfon Road  
Bangor  
Gwynedd  
North Wales LL57 4BU

## What's your number?

L ike Bill Longley (*Popular Computing Weekly*, August 19), I too attempted to convert David Lawrence's excellent renumbering program to run on the Spectrum, though without the same degree of sophistication as Mr Longley's version.

However, there were one or two points I came across which may be of interest to Messrs Lawrence and Longley, and other readers as well.

Firstly, I found I had to cope with a Restore statement. To do this I changed line 9967 to: *IF PEEK 1=200 OR PEEK 1=226 OR PEEK 1=237 THEN GOSUB 9971*

Secondly, I was not too happy about *Let X1=23755* in lines 9960 and 9977. I felt, perhaps mistakenly, that this might lead to problems when we all have Microdrives. I went to the system variables where I found (manual page 174) *Prog* at byte 23635. I therefore *Let X1=Peek 23635+256\*Peek 23636*.

Lastly, if you add a *Beep* statement in lines 9973 and

9980, you can change channels while this program is running and watch the box:

9973 *BEEP 3.3: STOP*  
9980 *IF LINE =9959 THEN BEEP 3.3: STOP*

A J Clavier  
10 Carnarvon Road  
Barnet  
Hertfordshire EN5 4LU

## No more requests—please

Since the appearance of your interview with me, *Popular Computing Weekly*, July 1, I have been swamped by requests for information about the Sinclair Amateur Radio User Group. So much so that I regret I am forced to cease my activities in this direction as soon as I conveniently can. This is brought about by several factors:

First — the totally excessive demand for information.

Secondly — the inability of most members to grasp the main reason for our existence as a group. Viz the *Sharing* of experience, information, programs and ideas in our chosen field of activity. Everybody wants but very few give.

Thirdly — as you know I formed the group as a voluntary, non-profit unit and continue to operate it as such. The burden of doing so and trying to give "value for money", especially in view of the sparsity of members input, is more than I am prepared to take.

I wonder therefore if you would be kind enough to publish a notice to the effect that no further enquiries can be dealt with in respect of SARUG. I would appreciate your assistance.

Congratulations on the continued improvement in *Popular Computing Weekly's* quality.

Paul Newman  
3 Red House Lane  
Leiston  
Suffolk IP16 4JZ

Paul Newman has been inundated with enquiries since our interview with him was published on July 1. He has asked us to inform our readers that he cannot cope with the massive response generated by the interview and would be grateful if people stopped trying to contact him.

# Tunnel

A new game for 16K  
ZX81 by Brian Hubbard

In this fast moving program you are at the head of a team of four space craft exploring one of two tunnels on an alien planet. You have to guide them through without hitting the sides of the tunnel.

Each of the four space craft are fitted with automatic lasers that will destroy any rocks directly in front of each ship, but the lasers use 10 times more fuel than the propulsion system. If you hit too many rocks your team will run out of fuel and be killed.

You have two controls, up and down, which are the keys 6 and 7. The other three space craft in your team automatically follow every move you make.

You start with 2000 units of fuel — the amount left is continuously displayed. A successful mission through the tunnel without hitting anything at all takes 1000

units of fuel, so you have 1000 units spare for the lasers.

When run, the program will give you instructions and ask you to choose which tunnel you wish to take. The computer will then go into fast mode and the basic program will store a random tunnel in the memory. You will see your team of space craft on the left-hand side of the screen with the tunnel entrance moving across the screen from right to left. Your team will be at the correct height for the tunnel entrance. The whole screen, including the 22nd and 23rd lines, will be taken up by black rock with a white tunnel running through it.

At the end of the game, you will be told whether or not it was a successful mission. You will then be asked whether you want to go through a new tunnel, in which case

the program will re-run, or whether you want to go through the same tunnel again.

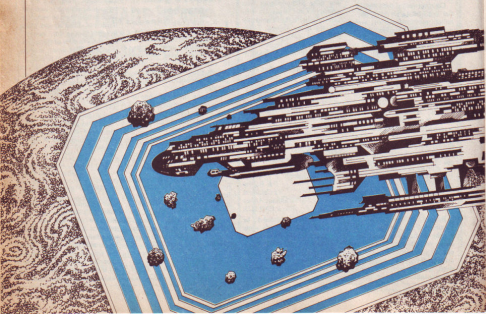
Line 1 holds the machine code program.  
Lines 10 to 24 give the instructions.  
Lines 25 to 70 set the width of the tunnel.  
Lines 80 to 92 give you further instructions.  
Lines 100 to 150 set up a list of 1000 numbers between 0 and 20, which is used by the machine code program to form the tunnel. The numbers refer to the distance of the tunnel from the top of the screen.  
Line 126 pokes stop code for machine code to recognise the end of the tunnel.  
Line 136 prints your starting fuel level. This can be changed provided you keep to a four figure number printed at the same position.  
Lines 137 to 150 set up variables for use by the machine code.  
Line 185 starts the machine code program and decides whether you run out of fuel or reached the end of the tunnel.  
Lines 190 to 210 are comments on your performance.  
Lines 220 to 270 re-run the program or run the same tunnel again.

#### Basic variables:

W — input which tunnel you want to take.  
Q — width of tunnel, can be changed for any width.  
A — distance of tunnel from top of screen.  
F — addresses where random numbers for the tunnel are stored.  
S — height of space craft at the start of the program. Notice that  $S = A$  at the start of the program so that the tunnel entrance and the team of space craft are all the same height to start the game.  
AE — input whether you want to re-run the same tunnel or try a different one.

#### Entering the program

First, put in the machine code program. To do this, type in the short decimal machine code loader program. Next, type line 1 rem followed by 237 "X" characters. It is important that the correct number of characters is used, or the computer may crash. To check you have the right number of char-



acters, Print Peek 16751. The answer should be 61, if not you need more characters. If Peek 16752 is not 118, then you need fewer characters.

When you have the right number of

characters, run the program. You will probably want to run it in Fast, to cut down the time it takes to type in all the numbers listed. When you have finished typing in all the numbers, you can check that they are

all correct simply by putting in the decimal machine code checking program without deleting line 1. The program will list all the numbers you have entered. If they are all correct, enter the main program.

```

2 REM ALL COPYRIGHT RESERVED
3 U HUBBARD 1982
4 CLS
5 PRINT "YOU ARE AT THE HEAD
OF A TEAM OF SPACE CRAFT EXPLORI
NG A TUNNEL ON AN ALIEN PLANET"
6 PRINT "EACH SPACE CRAFT HAS
HIGH POWER AUTOMATIC LASERS WHI
CH WILL DESTROY ALL ROCKS IN
FRONT OF THEM"
7 PRINT "THEY USE TEN TIMES M
ORE POWER THAN THE PROPULSION SY
STEM"
8 PRINT "BUT YOU ONLY HAVE 10
00 SPARE" UNITS FOR THE LASER
S TO USE"
9 PRINT "YOU CAN TAKE ONE OF
TWO TUNNELS. TUNNEL--1--HAS A WID
TH OF THREE" SPACE CRAFT AND TU
NNEL--2--HAS A WIDTH OF FIVE S
PACE CRAFT"
10 PRINT "PRESS WHICH TUNNEL Y
OU WANT"
11 INPUT U
12 IF U<1 AND U>2 THEN GOTO
9
13 IF U=1 THEN LET Q=3
14 IF U=2 THEN LET Q=5
15 POKE 16522,Q
16 CLS
17 PRINT "YOU HAVE APPROX. 15 S
ECONDES TO PREPARE YOUR SELF"
18 PRINT "YOUR CONTROLS ARE"
19 "FOR DOWN" "7" "FOR UP AND NO
KEY FOR" "STRAIGHT"
20 FOR Q=0 TO 300
21 NEXT Q
22 CLS
23 FAST
24 LET A=10
25 FOR F=30000 TO 31000
26 LET A=A+INT (RND*3)-1
27 LET A=A+(A*Q)-(A*20)
28 POKE F,A
29 NEXT F
30 POKE F,255
31 SLOW

```

```

136 PRINT AT 0,0;"FUEL=2000"
137 LET S=10
138 POKE 20000,S
139 POKE 20010,55
140 POKE 20011,17
141 IF USR 16514<>0000 THEN GOT
O 200
142 PRINT AT 0,0;"
143
144
145 GOTO 245
146 PRINT HT 10,0;"
147
148
149 IF U=2 THEN PRINT "
150
151 PRINT "
152
153 INPUT A$
154 IF A$="0" THEN RUN
155 IF A$="A" THEN GOTO 250
156 IF A$(">"A" AND A$("<"0" THEN
GOTO 250
157 CLS
158 GOTO 130

```

#### DECIMAL MACHINE CODE CHECKING PROGRAM

```

10 LET X=16514
11 SCROLL
20 PRINT X;" = ";PEEK X;" = ";
CHR$(PEEK X)
30 SCROLL
40 LET X=X+1
50 GOTO 20

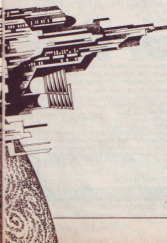
```

#### DECIMAL MACHINE CODE LOADER PROGRAM

```

10 LET X=16514
20 INPUT A
30 POKE X,A
40 PRINT A
50 LET X=X+1
60 SCROLL
70 GOTO 20

```



17 - 16514	40	6	40	237	12	164	78
31	6	54	2	75	64	32	75
0	54	126	24	32	35	221	175
42	128	25	242	78	35	42	190
58	25	13	35	175	35	32	32
117	13	24	16581	35	185	25	78
35	24	247	35	40	35	1	1
247	247	42	3	4	35	254	62
54	237	12	3 - 16615	25	35	239	24
117	75	64	3	13	35	237	190
78	48	17	22	24	35	80	32
62	117	33	0	249 - 16649	85	203	1
215	197	0	20	54	62	30	5
185	184	25	62	18	20	32	112
200	40 - 16559	17	23	0	186 - 16683	1	195
0	0	0	187	0	40	35	130
0	25	0	40	0	62	1	64
6	5	35	2	35	62	254	1
5	24	68	24	78	20	239 - 16718	15
237	249	77	228	62	185	237	39
67	193	3	42	128	32	80	201 - 16751
48	120	10	12	5	5	203	
117	129	119	64	1	54	90	
42	79	175	35	185	37	32	
32	62	7	35	32	24	43	
64	21	35	3	35	240	34	
25	145	3	35	54	8	21	
19	75	20	35	8	114	78	
19	175	62	17	6	5	33	
175	185	30	33	10	175	32	
185	40	185	0	42			

# Mysterious Adventures

VG20

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Richard Ross-Langley,  
Managing Director,  
Mine of Information Ltd.

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### SPECTRUM SOFTWARE WANTED



## Lynx: putting the cat among the pigeons

David Kelly talks to John Shirreff and Davis Jansons, co-designers of the Lynx.

The Lynx is a new low-cost micro from a Cambridge based company, Computers. As is the custom for British micros these days it has two designers.

John Shirreff and Davis Jansons, responsible for the hardware and software respectively, make an unlikely team. All they have in common is their Cambridge education, a sense of humour, and the Lynx.

John is substantially the elder of the two. He originally studied architecture, but admits to being something of an ageing hippy — a much travelled, soft-spoken, character who likes the Cambridge environment. He worked for GW Design Services, a sister company of Computers, before designing the Lynx. While at GW he worked on a project to develop a Z80-based business micro.

Davis is an intense 23-year-old with a quick grin. He studied mathematics at college and began Z80 programming as a part-time enthusiasm. He is a confirmed vegetarian who joined GW in the spring of this year.

Dick Greenwood, a director of GW Services, first had the idea of making a low-cost micro in March 1982. The company conducted a public opinion survey to find out where most micros fall down and how they could make a better one. From the poll it was decided that the Lynx should have at least 16K working Ram, colour, hi-resolution graphics, Basic, a full-size keyboard and potential for expansion.

With this brief, John and Davis began work on the Lynx in May this year.

John explained how he went about the design of the hardware: "There are pros and cons to being a hardware person. I get the lead fumes from the solder. Davis gets to sit in front of a VDU all day.

"At first I sat in the garden and thought about the possibilities. Then I did a timing diagram to see if it would work. The whole design philosophy was linked to expandability — particularly now that memory is becoming so cheap.

"The main difficulty with the design was its memory banking arrangement. I think we have developed a convenient and unconventional system which has many speed and software advantages. The expanded Lynx has 64K of video space and 64K of work space with 24K of Rom. The machine has been designed to switch memory in 64K blocks — larger units than most micros.

"There are problems switching 64K units on the Z80A — you end up switching



John Shirreff — originally studied architecture.

the section you are executing. But, there are new ways round these problems. Because of its memory banking the Lynx can run CP/M®. Most low-cost micros will not run CP/M® because the Rom gets in the way.

"This sets the Lynx apart from other micros making it much more flexible. You can keep hanging on extra 64K blocks of memory indefinitely.

"If the Lynx is used as a graphics terminal for a main-frame — for which it is well suited — you can dump a screen full of information into the work space, manipulate it, and put it back. The Z80 is a very good processor with a long future, particularly for bit manipulation. The snag is that it doesn't have a fixed access-time, but the Lynx gets round this.

"The expanded version has a bit-mapped hi-resolution display of 512 x 248. Each dot is accessible and colour programmable, with 16K per colour giving the 48K of video memory. This makes the display flexible. You could even add on a



Computers' Lynx with typewriter-style keyboard

parallel video bank to give a grey-scale.

"Once I thought it through, the actual design only took about three weeks. The first prototype was completed in early July and we now have the finished product, ready for launch in late October. I suppose it has all gone quite smoothly. At least, it does pretty much what I said it would."

Davis explains the software, "We wrote an entirely new Basic version for the Lynx. Most of it was written by me but the screen display driver was written by two other people — Shane Voss and Fiona Miller.

"When I started I worked out I had 10 weeks to complete it — six weeks to write



Davis Jansons, software designer.

it and four weeks to de-bug it, tidy it up and make it consistent throughout. "Both John and I have been working more than your standard 40-hour week — but never more than 90!"

Lynx Basic has been designed so that it is easy to modify. All the functions, commands, keywords and syntax checking are in tables held in Rom, but their pointers are kept in Ram. If you do not like one of the commands, or you want it to be more powerful, you can alter it.

Other features of the Basic are its optional single-keyword entry. You can type all the commands in full. Alternatively, you can use one key together with the Escape key. For example, Escape 9 gives Goto, Escape U gives Until, and so on.

"The Goto Label function seeks out a labelled line, without looking at the line numbers, which simplifies programming. The Code function allows machine-code to be entered easily.

"The statement is directly followed by the hex arguments and is ignored by the Basic program. The machine-code is then executed by Call Location which hunts out the Code function. The Lynx also includes a machine-code monitor for de-bugging machine-code programs."

To produce a completely new micro in 12 weeks is fast work. Both John and Davis are about to take short holidays.

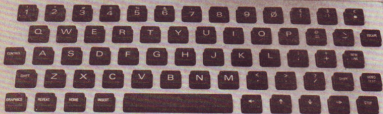
After the break John will be back to work on the disc drives, which have to be finished by November, and Davis begins work on an enhanced Level 2 Basic which is planned for Spring 1983.

# Return of the prodigal son

# Reviews

*NewBrain*

PRINT • RECHARGE •



**Paul Kriwaczek compares the NewBrain with the BBC micro.**

Hello NewBrain, nice to see you at long last. Now don't just sit there on the table looking so smug. I remember when you were no more than a gleam in Uncle Clive's eye.

Of course, a lot has happened to you since then. Nearly aborted directly after conception, and then adopted twice by different step-parents. You were chosen for elevation to the priesthood as the BBC micro and then summarily defrocked. In the meantime, Clive gave birth to three legitimate computers of his own. Still, you're here now, so let's see what kind of a machine you've turned out to be.

What is uppermost in many people's minds is how you compare with Acorn's version of the BBC micro. So here we go.

An attractive box — plastic, but quite tough and sturdy — in a rather pleasant colour combination, cream and brown, with the NewBrain logo printed in script at the top left. This is considerably more attractive than the lurid orange ivory in which I last saw NewBrain lurking. The lack of weight is quite surprising — 3lb according to my kitchen scales — but unlike NewBrain's stepbrothers from Sinclair, it has a feeling of quality about it. No executive briefcase would be embarrassed to contain it. And the small size is really remarkable — the BBC micro-computer is a giant by comparison. But then much of the expansion capability of the Acorn is already inside the box.

The connectors on the back of the NewBrain convey a message of quality too. They are small and elegant, adding

little to the bulk of the box, and seemingly an industrial precision connector system. Unfortunately, this means you won't be able to connect anything to the NewBrain unless you get it direct from its manufacturer — or are in on the secret of where to get suitable plugs.

The connectors link the machine to power input, two cassette recorders (each with its own sensitivity adjustment), modem, printer and bus expansion for all the promised add-on modules. Output to the screen display is from two normal phono sockets, one for a tv and the other direct video to feed a monitor.

The keyboard, standard QWERTY configuration, is what one might call up-market calculator-style — something between Spectrum and IBM — but arranged with keys the standard distance apart. At first sight, all the usual keys seem to be there. It takes some time to realise that there is neither a backspace nor a reset key. But, in return, we have an intelligence test — something labelled 'Video Text' (to which there is no reference in the manual and which does nothing noticeable to the display).

Good for word processing? I asked two secretaries of my acquaintance. No, they said. The keytops are too small — you'd keep getting your fingers stuck between them if you tried touch-typing. And the 'return' and 'shift' keys are the same size as the others — very easy to miss.

By comparison, the BBC micro's keyboard is more convenient to use. But, though the BBC keyboard is larger, it too does not have a real quality feel to it.

But what the NewBrain does have, which makes it unique so far, is a built-in single line 'vacuum fluorescent' display,

mounted at the top right of the box. This means that it can be used out of reach of a tv set or monitor, and even out of reach of a mains supply, provided you have the version with the added rechargeable batteries — and don't want to use it for more than 75 minutes.



Paul Kriwaczek, Producer of the BBC's Computer Programme first shown earlier this year.

Only one small matter detracts from the smart executive jet-set image. The small matter of the power supply. Small but heavy — heavier in fact than the computer itself; a nasty brown metal laboratory-style unit. Here is something you would not wish to carry around in your briefcase, not for long, anyway.

Another minor foible: there's no on-off switch. So for safety it has to be unplugged when not in use. It tells you so on the label right next to where it says 'For Indoor Use



Only", I notice that the power supply doesn't feature in the glossy advertising photographs.

So, connect it to the tv, plug in the power supply and what happens? Nothing, to start with, for what seems quite a long time. Wait a minute, the tv may be blank, but something is happening to the single-line display. What is it? It is garbage, 10 seconds' worth. And then just when you start to wonder "shall I bang it?" — standard diagnostic treatment for hi-tech apparatus — the single line display clears and the tv states: "NEUBRAIN BASIC READY".

Now is the time to start studying what is known in the jargon as the documentation, ie the instruction manual. It looks good, ring bound, glossy covered, 204 pages of it. But it is not good. It is awful.

Mind you, a properly produced handbook would have deprived me of a good many laughs. Here's my favourite, from the bottom of page 92: "The user should type in the following carefully," it says, "although the effect may not be seen until it is completed." And that's all it says. Not a word more. It is followed by a blank space. Maybe it only appears in the handbook after you have completed typing whatever it is into the machine. Or maybe they meant you to read on to the next page. Who can tell?

But the instructions to load a program from a tape are reasonably clear. So let's do it. Here's a NewBrain demo tape, supplied with the machine. Plug in cable between computer and recorder, type Load, run the tape and Hey Presto, it works... almost.

What's this? 'Error 131'. Look it up in Appendix 1: 8 pages of error numbers. At the bottom of the seventh, here we are:

*NewBrain, showing at top left of picture a so far unique built-in single line 'vacuum fluorescent' display. All the ports are located at the back, including the connector for the power pack. The keyboard has a standard QWERTY configuration, but there is no backspace or reset key.*

Error 131 — 'Tape read error: attempt to read block into a buffer which is too small, or hardware failure.' I don't understand what it means about the buffer, so try again. Still no good? Oh well, cassette systems are always a little prone to failure.

I'm afraid that the NewBrain does not give a very user friendly first impression. Here the BBC micro impresses as being more appropriate to the beginner. There is no question but that the operating system is one of great sophistication, but the very power of the device makes it more difficult to choose how to use it.

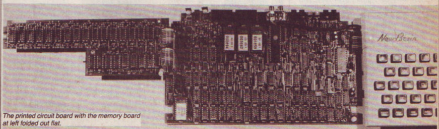
To start with, there are a number of different type-faces which can be called up at the touch of a button. The user manual tries to make it clear, but one false step, easily achieved, and the machine becomes insensitive to your input, responding to whatever you type with error messages in Greek. (Yes, a Greek alphabet is one of the options.)

For those with systems experience, the powerful way the NewBrain handles its

input, output and files — as data streams all of which look identical to the operating system — will be very attractive. For beginners, who merely wish to use the high-resolution graphics, it will not be easy to cope with this sort of explanation in the user guide: "As the graphic stream is 'parasitic' upon the linked stream given in this parameter, it cannot function after that stream has been closed (even by an OPEN# 0 implicit close) and must therefore also be closed." This is a shame because the graphics software is very powerful indeed, giving far greater control, albeit as yet only in monochrome, than BBC Basic does over a screen of equivalent resolution.

The rest of the NewBrain Basic is, however, a disappointment. It is billed as enhanced ANSI and is unusual in being an interactive compiler. This means that on going through the Basic program the statements are all first translated into machine code and then run, unlike an interpreter,

turn to page 20



*The printed circuit board with the memory board at left folded out flat.*

# Open Forum

*Open Forum is for you to publish your programs and ideas.*

*It is important that your programs are bug free before you send them in. We cannot test all of them.*

Contributions should be sent to: Popular Computing Weekly, Hobhouse Court,  
19 Whitcomb Street, London WC2H 7HF.

### How to contribute

Each week the editor goes through all the programs that you send to Open Forum in order to find the Program of the Week.

The author of that program will qualify for **DOUBLE** the usual fee we pay for published programs.  
(The usual fee is £10.)

### Presentation hints

Programs which are most likely to be considered for the Program of the Week will be computer printed and accompanied by a cassette.

The program will be well documented, the documentation being typed with a double spacing between each line.

The documentation should start with a general description of the program and then give some detail of how the program has been constructed and of its special features.

Listings taken from a ZX Printer should be cut into convenient lengths and carefully stuck down on to white paper, avoiding any creasing.

Please enclose a stamped, self-addressed envelope.

## Minivaders

### on Spectrum

Imagine that you are the sole defender of your planet, having at your disposal 3 mobile missile launchers and 100 missiles. The Minivader Fleet Commander with 50 spaceships has been ordered to invade your planet.

He sends them in one at a time. The first 25 are from high altitude, but the others can surprise you. The spaceships are equipped with:

Bombs (Type A) Specially designed to melt missile launchers.

**Bombs (Type B)** These explode to leave craters you can't get your missile launcher past.

A radiation diffuser which at close range will destroy your defence shields, invisibility screens.

Both types of bomb will also damage your defence shields. Type B bombs fill in the craters left by Type A bombs.

Although the bombs appear random, some are very accurate, so keep moving. You can move when a bomb is being dropped but you can't fire.

**Program notes:**

Key '8' To fire missile

'1' To move left

'2' To move right

LINE 2000 move launcher and check for missile firing

3000 fire missile

4000 flight of spaceship, check for hits and update.

[illegible]

5000 drop bomb  
6000 set up screen  
8000 end game  
8500 instructions  
9000 USSR graphics

ai	gun position
high	best score so far
hits	number of spaceships destroyed
missiles	number of missiles remaining
lives	number of launchers left

ALL As, Bs, Cs are graphic

LINE 4020 "32 50005"

Hits and highest score are shown at top of screen and the number of launchers left flashes at bottom right.

```

0040 IF HTN(144) GOTO THEN PRINT
0050 GOTO 0030
0060 PRINT "DUB 2084"
0070 PRINT AT J:P=
0080 PRINT AT J:P=
0090 PRINT AT J:P=
0100 PRINT AT J:P=
0110 RETURN
0120
0130 DOORER 0: PAPER 0: INK 0: C
0140
0150 PRINT AT 20.4: DOORER 0: C
0160 PRINT AT 22.1: "HIT 10.10"
0170 PRINT AT 10.11: "HIT 10.11"
0180 PRINT AT 10.12: "HIT 10.12"
0190
0200 PRINT AT 22.01: INK 0: PAPER
0210 PRINT AT 22.01: "HITS 10.10, 10.11, 10.12"
0220 RETURN
0230
0240 PRINT 000 PAGES 0: C
0250 PRINT 000 PAPER 0: INK
0260
0270 "YOUR SCORE IS: "
0280 "HIGHEST SCORE: "
0290 "HIGHEST DOOR: "
0300 "LINE IS: "
0310 "OR 25(1) "
0320 GOTO 1100
0330
0340
0350 PRINT AT 10.0: INK 1: "
0360
0370
0380
0390
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0990

```

## Open Forum

from previous page

```

0710 PRINT AT 1,3, PAPER 2, INK
0720 PRINT 1, FLASH 1, WIRNING
0730 PRINT AT 1,2,5: FLASH 1 TO 1N
0740 IF INKEY$="" THEN GO TO 0750
0750 RETURN
0760 STOP
08001 POKR US$R #1:8:270 000110000
08002 POKR US$R #2:8:270 000110000
08003 POKR US$R #3:8:270 000110000
08004 POKR US$R #4:8:270 000110000
08005 POKR US$R #5:8:270 000110000
08006 POKR US$R #6:8:270 000110000
08007 POKR US$R #7:8:270 000110000
08008 POKR US$R #8:8:270 000110000
08009 POKR US$R #9:8:270 000110000
08010 POKR US$R #10:8:270 000110000
08011 POKR US$R #11:8:270 000110000
08012 POKR US$R #12:8:270 000110000
08013 POKR US$R #13:8:270 000110000
08014 POKR US$R #14:8:270 000110000
08015 POKR US$R #15:8:270 000110000
08016 POKR US$R #16:8:270 000110000
08017 POKR US$R #17:8:270 000110000
08018 POKR US$R #18:8:270 000110000
08019 POKR US$R #19:8:270 000110000
08020 POKR US$R #20:8:270 000110000
08021 POKR US$R #21:8:270 000110000
08022 POKR US$R #22:8:270 000110000
08023 POKR US$R #23:8:270 000110000
08024 POKR US$R #24:8:270 000110000
08025 POKR US$R #25:8:270 000110000
08026 POKR US$R #26:8:270 000110000
08027 POKR US$R #27:8:270 000110000
08028 POKR US$R #28:8:270 000110000
08029 POKR US$R #29:8:270 000110000
08030 POKR US$R #30:8:270 000110000
08031 POKR US$R #31:8:270 000110000
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08035 POKR US$R #35:8:270 000110000
08036 POKR US$R #36:8:270 000110000
08037 POKR US$R #37:8:270 000110000
08038 POKR US$R #38:8:270 000110000
08039 POKR US$R #39:8:270 000110000
08040 POKR US$R #40:8:270 000110000
08041 POKR US$R #41:8:270 000110000
08042 POKR US$R #42:8:270 000110000
08043 POKR US$R #43:8:270 000110000
08044 POKR US$R #44:8:270 000110000
08045 POKR US$R #45:8:270 000110000
08046 POKR US$R #46:8:270 000110000
08047 POKR US$R #47:8:270 000110000
08048 POKR US$R #48:8:270 000110000
08049 POKR US$R #49:8:270 000110000
08050 POKR US$R #50:8:270 000110000
08051 POKR US$R #51:8:270 000110000
08052 POKR US$R #52:8:270 000110000
08053 POKR US$R #53:8:270 000110000
08054 POKR US$R #54:8:270 000110000
08055 POKR US$R #55:8:270 000110000
08056 POKR US$R #56:8:270 000110000
08057 POKR US$R #57:8:270 000110000
08058 POKR US$R #58:8:270 000110000
08059 POKR US$R #59:8:270 000110000
08060 POKR US$R #60:8:270 000110000
08061 POKR US$R #61:8:270 000110000
08062 POKR US$R #62:8:270 000110000
08063 POKR US$R #63:8:270 000110000
08064 POKR US$R #64:8:270 000110000
08065 POKR US$R #65:8:270 000110000
08066 POKR US$R #66:8:270 000110000
08067 POKR US$R #67:8:270 000110000
08068 POKR US$R #68:8:270 000110000
08069 POKR US$R #69:8:270 000110000
08070 POKR US$R #70:8:270 000110000
08071 POKR US$R #71:8:270 000110000
08072 POKR US$R #72:8:270 000110000
08073 POKR US$R #73:8:270 000110000
08074 POKR US$R #74:8:270 000110000
08075 POKR US$R #75:8:270 000110000
08076 POKR US$R #76:8:270 000110000
08077 POKR US$R #77:8:270 000110000
08078 POKR US$R #78:8:270 000110000
08079 POKR US$R #79:8:270 000110000
08080 POKR US$R #80:8:270 000110000
08081 POKR US$R #81:8:270 000110000
08082 POKR US$R #82:8:270 000110000
08083 POKR US$R #83:8:270 000110000
08084 POKR US$R #84:8:270 000110000
08085 POKR US$R #85:8:270 000110000
08086 POKR US$R #86:8:270 000110000
08087 POKR US$R #87:8:270 000110000
08088 POKR US$R #88:8:270 000110000
08089 POKR US$R #89:8:270 000110000
08090 POKR US$R #90:8:270 000110000
08091 POKR US$R #91:8:270 000110000
08092 POKR US$R #92:8:270 000110000
08093 POKR US$R #93:8:270 000110000
08094 POKR US$R #94:8:270 000110000
08095 POKR US$R #95:8:270 000110000
08096 POKR US$R #96:8:270 000110000
08097 POKR US$R #97:8:270 000110000
08098 POKR US$R #98:8:270 000110000
08099 POKR US$R #99:8:270 000110000
08100 POKR US$R #100:8:270 000110000
08101 POKR US$R #101:8:270 000110000
08102 POKR US$R #102:8:270 000110000
08103 POKR US$R #103:8:270 000110000
08104 POKR US$R #104:8:270 000110000
08105 POKR US$R #105:8:270 000110000
08106 POKR US$R #106:8:270 000110000
08107 POKR US$R #107:8:270 000110000
08108 POKR US$R #108:8:270 000110000
08109 POKR US$R #109:8:270 000110000
08110 POKR US$R #110:8:270 000110000
08111 POKR US$R #111:8:270 000110000
08112 POKR US$R #112:8:270 000110000
08113 POKR US$R #113:8:270 000110000
08114 POKR US$R #114:8:270 000110000
08115 POKR US$R #115:8:270 000110000
08116 POKR US$R #116:8:270 000110000
08117 POKR US$R #117:8:270 000110000
08118 POKR US$R #118:8:270 000110000
08119 POKR US$R #119:8:270 000110000
08120 POKR US$R #120:8:270 000110000
08121 POKR US$R #121:8:270 000110000
08122 POKR US$R #122:8:270 000110000
08123 POKR US$R #123:8:270 000110000
08124 POKR US$R #124:8:270 000110000
08125 POKR US$R #125:8:270 000110000
08126 POKR US$R #126:8:270 000110000
08127 POKR US$R #127:8:270 000110000
08128 POKR US$R #128:8:270 000110000
08129 POKR US$R #129:8:2
```

**Minivaders**  
by Keith Rylett

## Pathfinder

on ZY81

Pathfinder is a game involving quick thinking and accurate timing. It is written completely in Basic for the ZX81, but runs surprisingly fast due to the extensive use of direct manipulation of the display file by Peek and Poke commands.

Instructions are given in the program but the aim is to hit as many "X" targets as possible by steering your star around the screen with the cursor keys. If you crash into a used (inverse "X") target, the boundary, or your own trail, the game is over and your score is printed. On-screen-scoring and changeable delay factor have been introduced for interest.

It requires a minimum of 5K memory. My record score is 48 targets on delay factor 0.

```

1 REM *****
2 REM *****
3 REM *****
4 REM *****
5 REM *****
6 REM *****
7 REM *****
8 REM *****
9 REM *****
10 REM *****
11 REM *****
12 REM *****
13 REM *****
14 REM *****
15 REM *****
16 REM *****
17 REM *****
18 REM *****
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88 REM *****
89 REM *****
90 REM *****
91 REM *****
92 REM *****
93 REM *****
94 REM *****
95 REM *****
96 REM *****
97 REM *****
98 REM *****
99 REM *****
100 REM *****

```

### Dragon Tip

on Dragon 32

This program makes use of the fact that the machine will Load and Skip from within a program. It would normally be used as an index on a tape with finished programs. It takes less than half a minute to load, and saves the tedious use of the Skip command, in locating a program.

Lines 10-20 Clear the screen.

Lines 30-70 Read and display the contents of the data on screen.

Line 69 is a loop to slow the display down and is not needed if the tape has less than 10 programs on it.

The gap between lines 100 and 500 is for the addition of *Data* statements. A typical line would read, 100 DATA "(1 SPACE INVADERS:"

Line 500 is an empty string, to branch the program using line 50 to line 60000.

Line 519 waits for you to continue, and could be replaced by an *inkey*.

Line 520 deletes the program up to and including line 530.

Lines 60000-60050 skip the programs and load the one that you require, then delete themselves, leaving only the required program in memory.

This will only, of course, work for programs numbered below 60000, but the

```

375 LET H=1
380 GOSUB 3000
390 TO 13
4000 J=0
4100 J=0
4200 PRINT AT 0,0;" "
4300 FOR P=1 TO 5
4400 PRINT TAB 0,0;"TAB 31;" "
4500 PRINT
4600 PRINT AT 0,0;"TARGETS HIT:"
4700 GOSUB 3000
4800 RETURN
4900 END
5000 LET N=
5100 LET N=10000+2500*PEEK 1
5200
5300 LET P=0.4308
5400 LET C=1
5500 DIM T (4000)
5600 LET M=1
5700
5800 IF P=INT (RND*10)+1
5900 LET X=INT (RND*2)+1
6000 PRINT F, X

```

program can be relocated in any position to suit. A Run command could be added at line 60060, and the program will self execute on completion.

```

10 REM INDEX—
20 CLS
30 FOR A = 1 TO 100
40 READ AS : PRINT AS
50 IF LEN (AS) < 1 THEN 60030
60 FOR Z = 1 TO 1000 : NEXT
70 NEXT A
500 DATA ""
510 LINE INPUT "PRESS ANY KEY TO CON-
TINUE" : Z$
520 DEL 10 = 520
60000 INPUT "NUMBER OF PROGRAM RE-
QUIRED" : N
60010 FOR A = 1 TO (N - 1)
60020 SKIP
60030 NEXT A
60040 CLOAD
60050 DEL 60000 = 60050

```

The program, if entered as set out, will work for any length of tape, but if the program contents exceed, it will scroll and display the last 10 lines. Line 500 must not be left out, otherwise the program will stop with OD in line 40 (out of data).

Provided that enough space is left at the beginning of the tape, data lines containing extra programs can be added up to a maximum set by line 30.

## Snatch

### on Spectrum

Whilst looking for new ideas for computer games, I thought of combining Space Invaders with the fairground Hook

```

1 REM set up nice graphics
5 LET i=30
11 FOR i=1 TO 100: PAPER 6: INK 1
15 FOR n=0 TO 7
20 REHD
40 FOR USR "a"+n,a
50 NEXT n
60 FOR n=0 TO 7
70 REHD
90 FOR USR "b"+n,b
100 NEXT n
110 FOR n=0 TO 7
120 FOR n=0 TO 7
130 NEXT n
140 FOR n=0 TO 7
150 REHD
160 FOR USR "c"+n,c
170 NEXT n
180 FOR n=0 TO 7
190 NEXT n
200 REHD
210 FOR USR "a"+n,a
220 NEXT n
230 REHD
240 FOR USR "d"+n,d
250 NEXT n
260 FOR n=0 TO 7
270 NEXT n
280

```

machine, where you have to try to grab prizes with a large claw. The game I came up with is called *Snatch*, and is a cross between the two.

The listing contains a full set of instructions and *Rem* statements to tell the user what the computer is doing.

```

200 FOR USR "d-n.e
201 NEXT M
202 FOR N=0 TO 7
203 NEXT N
204 POKE USR "h-w.e,h
205 NEXT W
206 END
207 REM *****
208 REM *****
209 REM *****
300 INPUT AT 15,0:line1=FUNCTION67
301 PRINT AT 15,0:line2=4500
302 INPUT AT 0,0:SWITCH
303 IF SW=0:GOTO LINE305:IF SW=1:GOTO
304 LINE306:IF SW=2:GOTO LINE307:IF SW=
305 3:GOTO LINE308:IF SW=4:GOTO LINE309:IF SW=
306 5:GOTO LINE310:IF SW=6:GOTO LINE311:IF SW=
307 7:GOTO LINE312:IF SW=8:GOTO LINE313:IF SW=
308 9:GOTO LINE314:IF SW=10:GOTO LINE315:IF SW=
309 11:GOTO LINE316:IF SW=12:GOTO LINE317:IF SW=
310 13:GOTO LINE318:IF SW=14:GOTO LINE319:IF SW=
311 15:GOTO LINE320:IF SW=16:GOTO LINE321:IF SW=
312 17:GOTO LINE322:IF SW=18:GOTO LINE323:IF SW=
313 19:GOTO LINE324:IF SW=20:GOTO LINE325:IF SW=
314 21:GOTO LINE326:IF SW=22:GOTO LINE327:IF SW=
315 23:GOTO LINE328:IF SW=24:GOTO LINE329:IF SW=
316 25:GOTO LINE330:IF SW=26:GOTO LINE331:IF SW=
317 27:GOTO LINE332:IF SW=28:GOTO LINE333:IF SW=
318 29:GOTO LINE334:IF SW=30:GOTO LINE335:IF SW=
319 31:GOTO LINE336:IF SW=32:GOTO LINE337:IF SW=
320 33:GOTO LINE338:IF SW=34:GOTO LINE339:IF SW=
321 35:GOTO LINE340:IF SW=36:GOTO LINE341:IF SW=
322 37:GOTO LINE342:IF SW=38:GOTO LINE343:IF SW=
323 39:GOTO LINE344:IF SW=40:GOTO LINE345:IF SW=
324 41:GOTO LINE346:IF SW=42:GOTO LINE347:IF SW=
325 43:GOTO LINE348:IF SW=44:GOTO LINE349:IF SW=
326 45:GOTO LINE350:IF SW=46:GOTO LINE351:IF SW=
327 47:GOTO LINE352:IF SW=48:GOTO LINE353:IF SW=
328 49:GOTO LINE354:IF SW=50:GOTO LINE355:IF SW=
329 51:GOTO LINE356:IF SW=52:GOTO LINE357:IF SW=
330 53:GOTO LINE358:IF SW=54:GOTO LINE359:IF SW=
331 55:GOTO LINE360:IF SW=56:GOTO LINE361:IF SW=
332 57:GOTO LINE362:IF SW=58:GOTO LINE363:IF SW=
333 59:GOTO LINE364:IF SW=60:GOTO LINE365:IF SW=
334 61:GOTO LINE366:IF SW=62:GOTO LINE367:IF SW=
335 63:GOTO LINE368:IF SW=64:GOTO LINE369:IF SW=
336 65:GOTO LINE370:IF SW=66:GOTO LINE371:IF SW=
337 67:GOTO LINE372:IF SW=68:GOTO LINE373:IF SW=
338 69:GOTO LINE374:IF SW=70:GOTO LINE375:IF SW=
339 71:GOTO LINE376:IF SW=72:GOTO LINE377:IF SW=
340 73:GOTO LINE378:IF SW=74:GOTO LINE379:IF SW=
341 75:GOTO LINE380:IF SW=76:GOTO LINE381:IF SW=
342 77:GOTO LINE382:IF SW=78:GOTO LINE383:IF SW=
343 79:GOTO LINE384:IF SW=80:GOTO LINE385:IF SW=
344 81:GOTO LINE386:IF SW=82:GOTO LINE387:IF SW=
345 83:GOTO LINE388:IF SW=84:GOTO LINE389:IF SW=
346 85:GOTO LINE390:IF SW=86:GOTO LINE391:IF SW=
347 87:GOTO LINE392:IF SW=88:GOTO LINE393:IF SW=
348 89:GOTO LINE394:IF SW=90:GOTO LINE395:IF SW=
349 91:GOTO LINE396:IF SW=92:GOTO LINE397:IF SW=
350 93:GOTO LINE398:IF SW=94:GOTO LINE399:IF SW=
351 95:GOTO LINE400:IF SW=96:GOTO LINE401:IF SW=
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402 197:GOTO LINE502:IF SW=198:GOTO LINE503:IF SW=
403 199:GOTO LINE504:IF SW=200:GOTO LINE505:IF SW=
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405 203:GOTO LINE508:IF SW=204:GOTO LINE509:IF SW=
406 205:GOTO LINE510:IF SW=206:GOTO LINE511:IF SW=
407 207:GOTO LINE512:IF SW=208:GOTO LINE513:IF SW=
408 209:GOTO LINE514:IF SW=210:GOTO LINE515:IF SW=
409 211:GOTO LINE516:IF SW=212:GOTO LINE517:IF SW=
410 213:GOTO LINE518:IF SW=214:GOTO LINE519:IF SW=
411 215:GOTO LINE520:IF SW=216:GOTO LINE521:IF SW=
412 217:GOTO LINE522:IF SW=218:GOTO LINE523:IF SW=
413 219:GOTO LINE524:IF SW=220:GOTO LINE525:IF SW=
414 221:GOTO LINE526:IF SW=222:GOTO LINE527:IF SW=
415 223:GOTO LINE528:IF SW=224:GOTO LINE529:IF SW=
416 225:GOTO LINE530:IF SW=226:GOTO LINE531:IF SW=
417 227:GOTO LINE532:IF SW=228:GOTO LINE533:IF SW=
418 229:GOTO LINE534:IF SW=230:GOTO LINE535:IF SW=
419 231:GOTO LINE536:IF SW=232:GOTO LINE537:IF SW=
420 233:GOTO LINE538:IF SW=234:GOTO LINE539:IF SW=
421 235:GOTO LINE540:IF SW=236:GOTO LINE541:IF SW=
422 237:GOTO LINE542:IF SW=238:GOTO LINE543:IF SW=
423 239:GOTO LINE544:IF SW=240:GOTO LINE545:IF SW=
424 241:GOTO LINE546:IF SW=242:GOTO LINE547:IF SW=
425 243:GOTO LINE548:IF SW=244:GOTO LINE549:IF SW=
426 245:GOTO LINE550:IF SW=246:GOTO LINE551:IF SW
```

to next page

### PROGRAM OF THE WEEK

```

022 FOR N=13 TO 21: PRINT AT 13,0; "-AT
03 IF N=15: GOTO 13.04; "-AT
04 IF N=18: GOTO 13.05; "-AT
05 IF N=20: GOTO 13.06; "-AT
06 IF N=21: GOTO 13.07; "-AT
07 IF N=13: GOTO 13.08; "-AT
08 IF N=14: GOTO 13.09; "-AT
09 IF N=15: GOTO 13.10; "-AT
10 IF N=16: GOTO 13.11; "-AT
11 IF N=17: GOTO 13.12; "-AT
12 IF N=18: GOTO 13.13; "-AT
13 IF N=19: GOTO 13.14; "-AT
14 IF N=20: GOTO 13.15; "-AT
15 IF N=21: GOTO 13.16; "-AT
16 IF N=13: GOTO 13.17; "-AT
17 IF N=14: GOTO 13.18; "-AT
18 IF N=15: GOTO 13.19; "-AT
19 IF N=16: GOTO 13.20; "-AT
20 IF N=17: GOTO 13.21; "-AT
21 IF N=18: GOTO 13.22; "-AT
22 IF N=19: GOTO 13.23; "-AT
23 IF N=20: GOTO 13.24; "-AT
24 IF N=21: GOTO 13.25; "-AT
25 IF N=13: GOTO 13.26; "-AT
26 IF N=14: GOTO 13.27; "-AT
27 IF N=15: GOTO 13.28; "-AT
28 IF N=16: GOTO 13.29; "-AT
29 IF N=17: GOTO 13.30; "-AT
30 IF N=18: GOTO 13.31; "-AT
31 IF N=19: GOTO 13.32; "-AT
32 IF N=20: GOTO 13.33; "-AT
33 IF N=21: GOTO 13.34; "-AT
34 IF N=13: GOTO 13.35; "-AT
35 IF N=14: GOTO 13.36; "-AT
36 IF N=15: GOTO 13.37; "-AT
37 IF N=16: GOTO 13.38; "-AT
38 IF N=17: GOTO 13.39; "-AT
39 IF N=18: GOTO 13.40; "-AT
40 IF N=19: GOTO 13.41; "-AT
41 IF N=20: GOTO 13.42; "-AT
42 IF N=21: GOTO 13.43; "-AT
43 PRINT AT 17,18; "*****AT
44 IF N=13: GOTO 13.44; "-AT
45 IF N=14: GOTO 13.45; "-AT
46 IF N=15: GOTO 13.46; "-AT
47 IF N=16: GOTO 13.47; "-AT
48 IF N=17: GOTO 13.48; "-AT
49 IF N=18: GOTO 13.49; "-AT
50 IF N=19: GOTO 13.50; "-AT
51 IF N=20: GOTO 13.51; "-AT
52 IF N=21: GOTO 13.52; "-AT
53 IF N=13: GOTO 13.53; "-AT
54 IF N=14: GOTO 13.54; "-AT
55 IF N=15: GOTO 13.55; "-AT
56 IF N=16: GOTO 13.56; "-AT
57 IF N=17: GOTO 13.57; "-AT
58 IF N=18: GOTO 13.58; "-AT
59 IF N=19: GOTO 13.59; "-AT
60 IF N=20: GOTO 13.60; "-AT
61 IF N=21: GOTO 13.61; "-AT
62 IF N=13: GOTO 13.62; "-AT
63 IF N=14: GOTO 13.63; "-AT
64 IF N=15: GOTO 13.64; "-AT
65 IF N=16: GOTO 13.65; "-AT
66 IF N=17: GOTO 13.66; "-AT
67 IF N=18: GOTO 13.67; "-AT
68 IF N=19: GOTO 13.68; "-AT
69 IF N=20: GOTO 13.69; "-AT
70 IF N=21: GOTO 13.70; "-AT
71 IF N=13: GOTO 13.71; "-AT
72 IF N=14: GOTO 13.72; "-AT
73 IF N=15: GOTO 13.73; "-AT
74 IF N=16: GOTO 13.74; "-AT
75 IF N=17: GOTO 13.75; "-AT
76 IF N=18: GOTO 13.76; "-AT
77 IF N=19: GOTO 13.77; "-AT
78 IF N=20: GOTO 13.78; "-AT
79 IF N=21: GOTO 13.79; "-AT
80 IF N=13: GOTO 13.80; "-AT
81 IF N=14: GOTO 13.81; "-AT
82 IF N=15: GOTO 13.82; "-AT
83 IF N=16: GOTO 13.83; "-AT
84 IF N=17: GOTO 13.84; "-AT
85 IF N=18: GOTO 13.85; "-AT
86 IF N=19: GOTO 13.86; "-AT
87 IF N=20: GOTO 13.87; "-AT
88 IF N=21: GOTO 13.88; "-AT
89 IF N=13: GOTO 13.89; "-AT
90 IF N=14: GOTO 13.90; "-AT
91 IF N=15: GOTO 13.91; "-AT
92 IF N=16: GOTO 13.92; "-AT
93 IF N=17: GOTO 13.93; "-AT
94 IF N=18: GOTO 13.94; "-AT
95 IF N=19: GOTO 13.95; "-AT
96 IF N=20: GOTO 13.96; "-AT
97 IF N=21: GOTO 13.97; "-AT
98 IF N=13: GOTO 13.98; "-AT
99 IF N=14: GOTO 13.99; "-AT
100 IF N=15: GOTO 13.100; "-AT
101 IF N=16: GOTO 13.101; "-AT
102 IF N=17: GOTO 13.102; "-AT
103 IF N=18: GOTO 13.103; "-AT
104 IF N=19: GOTO 13.104; "-AT
105 IF N=20: GOTO 13.105; "-AT
106 IF N=21: GOTO 13.106; "-AT
107 IF N=13: GOTO 13.107; "-AT
108 IF N=14: GOTO 13.108; "-AT
109 IF N=15: GOTO 13.109; "-AT
110 IF N=16: GOTO 13.110; "-AT
111 IF N=17: GOTO 13.111; "-AT
112 IF N=18: GOTO 13.112; "-AT
113 IF N=19: GOTO 13.113; "-AT
114 IF N=20: GOTO 13.114; "-AT
115 IF N=21: GOTO 13.115; "-AT
116 IF N=13: GOTO 13.116; "-AT
117 IF N=14: GOTO 13.117; "-AT
118 IF N=15: GOTO 13.118; "-AT
119 IF N=16: GOTO 13.119; "-AT
120 IF N=17: GOTO 13.120; "-AT
121 IF N=18: GOTO 13.121; "-AT
122 IF N=19: GOTO 13.122; "-AT
123 IF N=20: GOTO 13.123; "-AT
124 IF N=21: GOTO 13.124; "-AT
125 IF N=13: GOTO 13.125; "-AT
126 IF N=14: GOTO 13.126; "-AT
127 IF N=15: GOTO 13.127; "-AT
128 IF N=16: GOTO 13.128; "-AT
129 IF N=17: GOTO 13.129; "-AT
130 IF N=18: GOTO 13.130; "-AT
131 IF N=19: GOTO 13.131; "-AT
132 IF N=20: GOTO 13.132; "-AT
133 IF N=21: GOTO 13.133; "-AT
134 IF N=13: GOTO 13.134; "-AT
135 IF N=14: GOTO 13.135; "-AT
136 IF N=15: GOTO 13.136; "-AT
137 IF N=16: GOTO 13.137; "-AT
138 IF N=17: GOTO 13.138; "-AT
139 IF N=18: GOTO 13.139; "-AT
140 IF N=19: GOTO 13.140; "-AT
141 IF N=20: GOTO 13.141; "-AT
142 IF N=21: GOTO 13.142; "-AT
143 IF N=13: GOTO 13.143; "-AT
144 IF N=14: GOTO 13.144; "-AT
145 IF N=15: GOTO 13.145; "-AT
146 IF N=16: GOTO 13.146; "-AT
147 IF N=17: GOTO 13.147; "-AT
148 IF N=18: GOTO 13.148; "-AT
149 IF N=19: GOTO 13.149; "-AT
150 IF N=20: GOTO 13.150; "-AT
151 IF N=21: GOTO 13.151; "-AT
152 IF N=13: GOTO 13.152; "-AT
153 IF N=14: GOTO 13.153; "-AT
154 IF N=15: GOTO 13.154; "-AT
155 IF N=16: GOTO 13.155; "-AT
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162 IF N=14: GOTO 13.162; "-AT
163 IF N=15: GOTO 13.163; "-AT
164 IF N=16: GOTO 13.164; "-AT
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166 IF N=18: GOTO 13.166; "-AT
167 IF N=19: GOTO 13.167; "-AT
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169 IF N=21: GOTO 13.169; "-AT
170 IF N=13: GOTO 13.170; "-AT
171 IF N=14: GOTO 13.171; "-AT
172 IF N=15: GOTO 13.172; "-AT
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178 IF N=21: GOTO 13.178; "-AT
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180 IF N=14: GOTO 13.180; "-AT
181 IF N=15: GOTO 13.181; "-AT
182 IF N=16: GOTO 13.182; "-AT
183 IF N=17: GOTO 13.183; "-AT
184 IF N=18: GOTO 13.184; "-AT
185 IF N=19: GOTO 13.185; "-AT
186 IF N=20: GOTO 13.186; "-AT
187 IF N=21: GOTO 13.187; "-AT
188 IF N=13: GOTO 13.188; "-AT
189 IF N=14: GOTO 13.189; "-AT
190 IF N=15: GOTO 13.190; "-AT
191 IF N=16: GOTO 13.191; "-AT
192 IF N=17: GOTO 13.192; "-AT
193 IF N=18: GOTO 13.193; "-AT
194 IF N=19: GOTO 13.194; "-AT
195 IF N=20: GOTO 13.195; "-AT
196 IF N=21: GOTO 13.196; "-AT

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445 1000 X
446 1000 Y
447 1000 Z
448 1000 W
449 1000 V
450 1000 U
451 1000 T
452 1000 S
453 1000 R
454 1000 Q
455 1000 P
456 1000 O
457 1000 N
458 1000 M
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470 1000 A
471 1000 Z
472 1000 Y
473 1000 X
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823 1000 L
824 1000 K
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836 1000 Y
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900 LET C=INT (RND*51)
905 PRINT AT 2,n,INK 0; "C="; C
910 GOTO 920
920 REM first sum
925 LET S=C
930 FOR I=1 TO 100: GOTO 935
935 LET S=C+PLOT 0,184: DRAW INK 4
940 IF S<=5 THEN PLOT 0,128: DRAW INK 5
945 IF S<=10 THEN PLOT 0,192: DRAW INK 6
950 IF S<=15 THEN PLOT 0,256: DRAW INK 7
955 IF S<=20 THEN PLOT 0,320: DRAW INK 8
960 IF S<=25 THEN PLOT 0,384: DRAW INK 9
965 IF S<=30 THEN PLOT 0,448: DRAW INK 10
970 IF S<=35 THEN PLOT 0,512: DRAW INK 11
975 IF S<=40 THEN PLOT 0,576: DRAW INK 12
980 IF S<=45 THEN PLOT 0,640: DRAW INK 13
985 IF S<=50 THEN PLOT 0,704: DRAW INK 14
990 IF S<=55 THEN PLOT 0,768: DRAW INK 15
995 IF S<=60 THEN PLOT 0,832: DRAW INK 16
1000 IF S<=65 THEN PLOT 0,896: DRAW INK 17
1005 IF S<=70 THEN PLOT 0,960: DRAW INK 18
1010 IF S<=75 THEN PLOT 0,1024: DRAW INK 19
1015 IF S<=80 THEN PLOT 0,1088: DRAW INK 20
1020 IF S<=85 THEN PLOT 0,1152: DRAW INK 21
1025 IF S<=90 THEN PLOT 0,1216: DRAW INK 22
1030 IF S<=95 THEN PLOT 0,1280: DRAW INK 23
1035 IF S<=100 THEN PLOT 0,1344: DRAW INK 24
1040 IF S<=105 THEN PLOT 0,1408: DRAW INK 25
1045 IF S<=110 THEN PLOT 0,1472: DRAW INK 26
1050 IF S<=115 THEN PLOT 0,1536: DRAW INK 27
1055 IF S<=120 THEN PLOT 0,1600: DRAW INK 28
1060 IF S<=125 THEN PLOT 0,1664: DRAW INK 29
1065 IF S<=130 THEN PLOT 0,1728: DRAW INK 30
1070 IF S<=135 THEN PLOT 0,1792: DRAW INK 31
1075 IF S<=140 THEN PLOT 0,1856: DRAW INK 32
1080 IF S<=145 THEN PLOT 0,1920: DRAW INK 33
1085 IF S<=150 THEN PLOT 0,1984: DRAW INK 34
1090 IF S<=155 THEN PLOT 0,2048: DRAW INK 35
1095 IF S<=160 THEN PLOT 0,2112: DRAW INK 36
1100 IF S<=165 THEN PLOT 0,2176: DRAW INK 37
1105 IF S<=170 THEN PLOT 0,2240: DRAW INK 38
1110 IF S<=175 THEN PLOT 0,2304: DRAW INK 39
1115 IF S<=180 THEN PLOT 0,2368: DRAW INK 40
1120 IF S<=185 THEN PLOT 0,2432: DRAW INK 41
1125 IF S<=190 THEN PLOT 0,2496: DRAW INK 42
1130 IF S<=195 THEN PLOT 0,2560: DRAW INK 43
1135 IF S<=200 THEN PLOT 0,2624: DRAW INK 44
1140 IF S<=205 THEN PLOT 0,2688: DRAW INK 45
1145 IF S<=210 THEN PLOT 0,2752: DRAW INK 46
1150 IF S<=215 THEN PLOT 0,2816: DRAW INK 47
1155 IF S<=220 THEN PLOT 0,2880: DRAW INK 48
1160 IF S<=225 THEN PLOT 0,2944: DRAW INK 49
1165 IF S<=230 THEN PLOT 0,3008: DRAW INK 50
1170 IF S<=235 THEN PLOT 0,3072: DRAW INK 51
1175 IF S<=240 THEN PLOT 0,3136: DRAW INK 52
1180 IF S<=245 THEN PLOT 0,3200: DRAW INK 53
1185 IF S<=250 THEN PLOT 0,3264: DRAW INK 54
1190 IF S<=255 THEN PLOT 0,3328: DRAW INK 55
1195 IF S<=260 THEN PLOT 0,3392: DRAW INK 56
1200 IF S<=265 THEN PLOT 0,3456: DRAW INK 57
1205 IF S<=270 THEN PLOT 0,3520: DRAW INK 58
1210 IF S<=275 THEN PLOT 0,3584: DRAW INK 59
1215 IF S<=280 THEN PLOT 0,3648: DRAW INK 60
1220 IF S<=285 THEN PLOT 0,3712: DRAW INK 61
1225 IF S<=290 THEN PLOT 0,3776: DRAW INK 62
1230 IF S<=295 THEN PLOT 0,3840: DRAW INK 63
1235 IF S<=300 THEN PLOT 0,3904: DRAW INK 64
1240 IF S<=305 THEN PLOT 0,3968: DRAW INK 65
1245 IF S<=310 THEN PLOT 0,4032: DRAW INK 66
1250 IF S<=315 THEN PLOT 0,4096: DRAW INK 67
1255 IF S<=320 THEN PLOT 0,4160: DRAW INK 68
1260 IF S<=325 THEN PLOT 0,4224: DRAW INK 69
1265 IF S<=330 THEN PLOT 0,4288: DRAW INK 70
1270 IF S<=335 THEN PLOT 0,4352: DRAW INK 71
1275 IF S<=340 THEN PLOT 0,4416: DRAW INK 72
1280 IF S<=345 THEN PLOT 0,4480: DRAW INK 73
1285 IF S<=350 THEN PLOT 0,4544: DRAW INK 74
1290 IF S<=355 THEN PLOT 0,4608: DRAW INK 75
1295 IF S<=360 THEN PLOT 0,4672: DRAW INK 76
1300 IF S<=365 THEN PLOT 0,4736: DRAW INK 77
1305 IF S<=370 THEN PLOT 0,4800: DRAW INK 78
1310 IF S<=375 THEN PLOT 0,4864: DRAW INK 79
1315 IF S<=380 THEN PLOT 0,4928: DRAW INK 80
1320 IF S<=385 THEN PLOT 0,4992: DRAW INK 81
1325 IF S<=390 THEN PLOT 0,5056: DRAW INK 82
1330 IF S<=395 THEN PLOT 0,5120: DRAW INK 83
1335 IF S<=400 THEN PLOT 0,5184: DRAW INK 84
1340 IF S<=405 THEN PLOT 0,5248: DRAW INK 85
1345 IF S<=410 THEN PLOT 0,5312: DRAW INK 86
1350 IF S<=415 THEN PLOT 0,5376: DRAW INK 87
1355 IF S<=420 THEN PLOT 0,5440: DRAW INK 88
1360 IF S<=425 THEN PLOT 0,5504: DRAW INK 89
1365 IF S<=430 THEN PLOT 0,5568: DRAW INK 90
1370 IF S<=435 THEN PLOT 0,5632: DRAW INK 91
1375 IF S<=440 THEN PLOT 0,5696: DRAW INK 92
1380 IF S<=445 THEN PLOT 0,5760: DRAW INK 93
1385 IF S<=450 THEN PLOT 0,5824: DRAW INK 94
1390 IF S<=455 THEN PLOT 0,5888: DRAW INK 95
1395 IF S<=460 THEN PLOT 0,5952: DRAW INK 96
1400 IF S<=465 THEN PLOT 0,6016: DRAW INK 97
1405 IF S<=470 THEN PLOT 0,6080: DRAW INK 98
1410 IF S<=475 THEN PLOT 0,6144: DRAW INK 99
1415 IF S<=480 THEN PLOT 0,6208: DRAW INK 100
1420 IF S<=485 THEN PLOT 0,6272: DRAW INK 101
1425 IF S<=490 THEN PLOT 0,6336: DRAW INK 102
1430 IF S<=495 THEN PLOT 0,6400: DRAW INK 103
1435 IF S<=500 THEN PLOT 0,6464: DRAW INK 104
1440 IF S<=505 THEN PLOT 0,6528: DRAW INK 105
1445 IF S<=510 THEN PLOT 0,6592: DRAW INK 106
1450 IF S<=515 THEN PLOT 0,6656: DRAW INK 107
1455 IF S<=520 THEN PLOT 0,6720: DRAW INK 108
1460 IF S<=525 THEN PLOT 0,6784: DRAW INK 109
1465 IF S<=530 THEN PLOT 0,6848: DRAW INK 110
1470 IF S<=535 THEN PLOT 0,6912: DRAW INK 111
1475 IF S<=540 THEN PLOT 0,6976: DRAW INK 112
1480 IF S<=545 THEN PLOT 0,7040: DRAW INK 113
1485 IF S<=550 THEN PLOT 0,7104: DRAW INK 114
1490 IF S<=555 THEN PLOT 0,7168: DRAW INK 115
1495 IF S<=560 THEN PLOT 0,7232: DRAW INK 116
1500 IF S<=565 THEN PLOT 0,7296: DRAW INK 117
1505 IF S<=570 THEN PLOT 0,7360: DRAW INK 118
1510 IF S<=575 THEN PLOT 0,7424: DRAW INK 119
1515 IF S<=580 THEN PLOT 0,7488: DRAW INK 120
1520 IF S<=585 THEN PLOT 0,7552: DRAW INK 121
1525 IF S<=590 THEN PLOT 0,7616: DRAW INK 122
1530 IF S<=595 THEN PLOT 0,7680: DRAW INK 123
1535 IF S<=600 THEN PLOT 0,7744: DRAW INK 124
1540 IF S<=605 THEN PLOT 0,7808: DRAW INK 125
1545 IF S<=610 THEN PLOT 0,7872: DRAW INK 126
1550 IF S<=615 THEN PLOT 0,7936: DRAW INK 127
1555 IF S<=620 THEN PLOT 0,8000: DRAW INK 128
1560 IF S<=625 THEN PLOT 0,8064: DRAW INK 129
1565 IF S<=630 THEN PLOT 0,8128: DRAW INK 130
1570 IF S<=635 THEN PLOT 0,8192: DRAW INK 131
1575 IF S<=640 THEN PLOT 0,8256: DRAW INK 132
1580 IF S<=645 THEN PLOT 0,8320: DRAW INK 133
1585 IF S<=650 THEN PLOT 0,8384: DRAW INK 134
1590 IF S<=655 THEN PLOT 0,8448: DRAW INK 135
1595 IF S<=660 THEN PLOT 0,8512: DRAW INK 136
1600 IF S<=665 THEN PLOT 0,8576: DRAW INK 137
1605 IF S<=670 THEN PLOT 
```

```

1040 NEXT N
1050 REMUSE 100: CLS : GO TO 400
1060 REM routine for if you get
1070 S=2
1080 FOR S=24 TO -34 STEP -2: BE
1090 S=S+1
1100 PRINT AT 21,P;"I:AT 20:P
1110 REMUSE 100: CLS : GO TO 400
1120 REM routine for if you get
1130 S=2
1140 FOR S=24 TO -34 STEP -2: BE
1150 S=S+1
1160 PRINT AT 21,P;"I:AT 20:P
1170 REMUSE 100: CLS : GO TO 400
1180 REM routine for if you get
1190 S=2
1200 FOR S=24 TO -34 STEP -2: BE
1210 S=S+1
1220 PRINT AT 21,P;"I:AT 20:P
1230 REMUSE 100: CLS : GO TO 400
1240 REM routine for if you get
1250 S=2
1260 FOR S=24 TO -34 STEP -2: BE
1270 S=S+1
1280 PRINT AT 21,P;"I:AT 20:P
1290 REMUSE 100: CLS : GO TO 400
1300 REM routine for if you get
1310 S=2
1320 FOR S=24 TO -34 STEP -2: BE
1330 S=S+1
1340 PRINT AT 21,P;"I:AT 20:P
1350 REMUSE 100: CLS : GO TO 400
1360 REM routine for if you get
1370 S=2
1380 FOR S=24 TO -34 STEP -2: BE
1390 S=S+1
1400 PRINT AT 21,P;"I:AT 20:P
1410 REMUSE 100: CLS : GO TO 400
1420 REM routine for if you get
1430 S=2
1440 FOR S=24 TO -34 STEP -2: BE
1450 S=S+1
1460 PRINT AT 21,P;"I:AT 20:P
1470 REMUSE 100: CLS : GO TO 400
1480 REM routine for if you get
1490 S=2
1500 FOR S=24 TO -34 STEP -2: BE
1510 S=S+1
1520 PRINT AT 21,P;"I:AT 20:P
1530 REMUSE 100: CLS : GO TO 400
1540 REM routine for if you get
1550 S=2
1560 FOR S=24 TO -34 STEP -2: BE
1570 S=S+1
1580 PRINT AT 21,P;"I:AT 20:P
1590 REMUSE 100: CLS : GO TO 400
1600 REM routine for if you get
1610 S=2
1620 FOR S=24 TO -34 STEP -2: BE
1630 S=S+1
1640 PRINT AT 21,P;"I:AT 20:P
1650 REMUSE 100: CLS : GO TO 400
1660 REM routine for if you get
1670 S=2
1680 FOR S=24 TO -34 STEP -2: BE
1690 S=S+1
1700 PRINT AT 21,P;"I:AT 20:P
1710 REMUSE 100: CLS : GO TO 400
1720 REM routine for if you get
1730 S=2
1740 FOR S=24 TO -34 STEP -2: BE
1750 S=S+1
1760 PRINT AT 21,P;"I:AT 20:P
1770 REMUSE 100: CLS : GO TO 400
1780 REM routine for if you get
1790 S=2
1800 FOR S=24 TO -34 STEP -2: BE
1810 S=S+1
1820 PRINT AT 21,P;"I:AT 20:P
1830 REMUSE 100: CLS : GO TO 400
1840 REM routine for if you get
1850 S=2
1860 FOR S=24 TO -34 STEP -2: BE
1870 S=S+1
1880 PRINT AT 21,P;"I:AT 20:P
1890 REMUSE 100: CLS : GO TO 400
1900 REM routine for if you get
1910 S=2
1920 FOR S=24 TO -34 STEP -2: BE
1930 S=S+1
1940 PRINT AT 21,P;"I:AT 20:P
1950 REMUSE 100: CLS : GO TO 400
1960 REM routine for if you get
1970 S=2
1980 FOR S=24 TO -34 STEP -2: BE
1990 S=S+1
2000 PRINT AT 21,P;"I:AT 20:P

```

```
0000 RUN
0001 CHYR BIN 00011111 BIN 000111
0002 CHYR BIN 00011111 BIN 000111
0003 CHYR BIN 00011111 BIN 000111
0004 CHYR BIN 00011111 BIN 000111
0005 CHYR BIN 00011111 BIN 000111
0006 CHYR BIN 00011111 BIN 000111
0007 CHYR BIN 00011111 BIN 000111
0008 CHYR BIN 00011111 BIN 000111
0009 CHYR BIN 00011111 BIN 000111
0010 CHYR BIN 00011111 BIN 000111
0011 CHYR BIN 00011111 BIN 000111
0012 CHYR BIN 00011111 BIN 000111
0013 CHYR BIN 00011111 BIN 000111
0014 CHYR BIN 00011111 BIN 000111
0015 CHYR BIN 00011111 BIN 000111
0016 CHYR BIN 00011111 BIN 000111
0017 CHYR BIN 00011111 BIN 000111
0018 CHYR BIN 00011111 BIN 000111
0019 CHYR BIN 00011111 BIN 000111
0020 CHYR BIN 00011111 BIN 000111
```



### Snatch

by Jonathon Yeomans

## on Vic-20

This is a space invader game with a difference. At any one time three invaders pass in front of you from the top of the screen (each having a different score value) and which you simply have to shoot. You can shoot the alien when it appears

anywhere in the sight.

But beware, there are six invisible black holes in front of you. You will be sucked into the black hole when the centre of the sight passes over one of these holes. Should you fall into a black hole then all accumulated scores are lost.

You have a limited amount of ammunition and a limited amount of time to shoot as many invaders as possible. At the top of

the screen the running score and elapsed time is shown.

A good average for the game is 100. The best score for the game so far is 240. All keyboard directions are shown in the instructions.

The program runs in a minimum of 6.5K and can also be used without any modification with any memory above that level. All subroutines are covered in the program listing by *Rem* statements.

```

270 PRINT"000000 BLACK HOLE 0 0'"
1 REM (C) 1982
2 REM N.ECKERSLEY
3 POKE36879,40
240 PRINT"000000000000"
250 PRINT"0000 0 0'"
260 PRINT"0000 0 0'"
270 PRINT"0000 0 0' BLACK HOLE 0 0'"
280 PRINT"0000 0 0'"
290 PRINT"0000 0 0'"
300 PRINT"0000 0 0'"
310 FORA=1TO3000:NEXT
320 PRINT"0:"POKE36879,104:DINT(20)
330 PRINT"0000000000INSTRUCTIONS(V,N)";
340 GETAF
350 IFAF="V"THEN10000
360 IFAF="N"THEN12166
370 GOTO340
380 REM INITIALISATION
381 SC=0:COD=30720:J1=7782:J2=38884:S=7910:
J3=0164:J4=8140:J5=7725:J6=7680
382 PRINT"0:"IFPEEK(4096)=32THENGOSUB50000
390 POKE36879,104:PRINT"0"
391 FORLS=1TO20
392 POKEJ3+LS,102:POKEJ2+LS,7:1FLSC=5THENPOKE
J2+LS,2
393 NEXTLS:VL=20
399 FORC=1TO1000
400 S=INT(RND(1)*450)+J1
410 POKEB,46
411 NEXTC
420 FORD=1TO6

```

```

430 E(D)=INRND(1)*400)+J1
450 NEXTD
451 REM SIGHT MOVEMENT
452 T1$="000000" I$VAR=99,99 I$OUSUB470 I$VAR=0
453 GET$S$:POKE130,0
456 PRINT "S"TAB(12)*TIME$HID$(T1$,4,1)*",
      "RIGHT$(T1$,2)
457 IF T1$>"000200" THEN #E7=1:GO TO 20000
458 IF T1<1 THEN #E8
459 IF $S$="" THEN $S$0
460 IF $S$="K" THEN #G0SUB6000
461 IF O1=99,99 THEN #V7=99,99 I$OUSUB7000 I$OUSUB460:
      V7=0:GO TO 0491
462 IF $S$="I" THEN #G0SUB5000: $S$=22
463 IF $S$="J" THEN #G0SUB5000: $S$=1
464 IF $S$="L" THEN #G0SUB5000: $S$=1
465 IF $S$="M" THEN #G0SUB5000: $S$=22
466 FORD=1706: IFS=E(D) THEN #E7=2:GO TO 20000
467 NEXTD
468 IFS$=J4 THEN $S$=12
469 IFS$=J5 THEN $S$=J5
470 REM DRAW, SIGHT
471 POKES=1,67: POKES=1,67: POKES=22,66:
      POKES=22,66
480 POKES=23,122: POKES=21,76: POKES=23,79:
      POKES=21,80
491 IF V7=99,99 THEN RETURN
492 IF VAR=99,99 THEN RETURN
499 GO TO 0590
600 PRINT "S"TAB(12)*TIME$HID$(T1$,4,1)*",
      "RIGHT$(T1$,2)
601 O1=0
602 REM ALIEN MOVEMENT
603 FOR #G0=1705
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```

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```

500 TT=INT(RND(1)*9)+1
510 IF TT<5 THEN GOTO 580:COL=COL+3
520 IF TT<5 THEN GOTO 590:COL=COL+7
530 IF TT<8 THEN GOTO 650:COL=COL+5
540 NEXT X
551 FOR V=1 TO 3
555 PRINT "TAB(12) TIME: " MID$(T$,4,1) ". RIGHT$(
  T$,2)
560 F(V)=INT(RND(1)*462)+J1
570 POKEF(V),G(V):IPOKEC00+F(V),COL(V)
580 NEXT V
590 PRINT "TAB(12) TIME: " MID$(T$,4,1) ". RIGHT$(
  T$,2) : V=99:99:100SUB468:V=0
591 FOR T=1 TO 3: IF T=0 THEN F(T)=INT(RND(1)*22)+J1
600 NEXT T:100SUB968
610 FOR K=1 TO 3
613 WH=INT(RND(1)*3)+1
620 IF WH=1 THEN R(R)=22
630 IF WH=2 THEN R(R)=23
640 IF WH=3 THEN R(R)=21
650 NEXT R
660 FOR O=1 TO 3
690 POKE(O),32:POKEC00+F(O),1:IF(O)=F(O)+R(X)
  X:IF(X)<3 THEN F(O)=0:100T059
700 POKE(O),0:O=O+POKEC00+F(O),COL(O)
710 NEXT O:100T0455
1092 IF G=99 OR G=90 OR G=65 THEN IPOKES,42:FOR O=1 TO
  100:INEXT I:POKES,32
5000 POKES+23,32:POKES+21,32:POKES-23,32:
  POKES-21,32
5010 POKES+1,32:POKES-1,32:POKES-22,32:
  POKES+22,32
5020 RETURN
5999 REM FIRING
6000 POKEJ3+VL,32:VL=VL-1:IF VL<0 THEN ME7=3:
  GOTO20000
6001 FP(1)=0
6002 FP(2)=22
6003 FP(3)=23
6004 FP(4)=21
6005 FP(5)=1
6006 FP(6)=1
6007 FP(7)=22
6008 FP(8)=23
6009 FP(9)=21
6010 FOR RT=5 TO 1 STEP-1
6011 E3=S+RT
6012 E4=S-RT
6017 POKE36878,15:POKE36876,231:POKE36878,0:
  POKEE3,67:POKEC00+E3,2
6018 POKEE4,67:POKEC00+E4,2
6019 FORA=1 TO 30:INEXT
6021 POKEE3,32:POKEC00+E3,1
6022 POKEE4,32:POKEC00+E4,1
6025 NEXT RT
6027 FORR=1 TO 3
6028 POKEF(R),G(R)
6029 NEXT R
6030 FOR RF=1 TO 9
6040 GR=PEEK(S+FP(RF))
6050 IF GR=98 THEN SC=SC+10:100T09000
6060 IF GR=90 THEN SC=SC+15:100T09000
6070 IF GR=65 THEN SC=SC+25:100T09000
6080 NEXT RF
6091 POKES,91:FOR PL=1 TO 30:POKES,42:FOR PL=1 TO 30:
  POKES,32
6090 RETURN
7000 FOR U=1 TO 3
7010 POKE(VU),32:INEXT
7020 RETURN
9000 REM EXPLOSION
9001 OI=99,99:FOR O=1 TO 3:POKEC00+F(O),1:INEXT O
9002 PRINT "SCORE " ; SC
9003 AB=42:100SUB9500:AB=81:100SUB9500:AB=87:
  100SUB9500
9005 AB=46:100SUB9500:AB=32:100SUB9500:IF(R)=
  0:INEXT R
9500 POKE36878,15
9511 FOR LL=220 TO 230
9512 POKE36876,LL
9513 NEXT LL
9514 POKE36878,0
9515 POKE36876,0
9516 POKES,AB:POKES+1,AB:POKES-1,AB:POKES+22,AB:
  POKES-22,AB
9517 IFS=44:J1 THEN POKES=44,AB
9518 IFS=44:J3 THEN POKES=44,AB
9519 POKES-2,AB:POKES+2,AB:POKES-23,AB:POKES-21,
  AB
9520 POKES+21,AB:POKES+23,AB:RETURN
9600 B=INT(RND(1)*450)+J1:IF PEEK(B)<32 THEN 9680
9620 POKEB,46
9640 RETURN
10000 REM INSTRUCTIONS
10001 PRINT "YOU ARE THE CAPTAIN OF THE U.S.
  BOUNTY, YOU ARE UNDER ATTACK BY ALIENS"
10002 PRINT "YOU HAVE ONLY 20 SHOTS LEFT. THEY ARE
  SHOOTING"
10040 PRINT "AT THE BOTTOM OF THE SCREEN,"
10050 PRINT "SEPARATE THERE ARE 6 INVISIBLE
  BLACK HOLES. IF YOUR SIGHT RUNS"
10051 PRINT "OVER ONE OF THESE THEN THAT I AM
  AFRAID"
10060 PRINT "IS THE END OF YOU AND YOUR SHIP"
10061 PRINT "ALSO YOUR FORCE FIELD REPORTS THAT
  YOU CAN ONLY LAST FOR 2 MIN. OF ATTACKS"
10070 PRINT "PRESS SPACE TO CONT."
10080 GETA:IF A<=" " THEN 10080
10090 PRINT "SIGHT MOVEMENTS"
10100 PRINT "
  UP"
10110 PRINT "
  I"
10120 PRINT "
  L"
10130 PRINT "LEFT J L RIGHT"
10140 PRINT "
  H"
10150 PRINT "
  DOWN"
10161 PRINT "
  TO FIRE"
10164 PRINT "PRESS SPACE TO CONT."
10165 GETA:IF A<=" " THEN 10165
10166 PRINT "ALIEN SCORING"
10167 PRINT "
  "
10168 REM I1:IF I1=" " THEN 12166
10169 FOR S=1 TO LEN(I1)
10170 REM "TAB(20) MID$(I1,S,1)
10171 PRINT "CHR$(20):POKEDELAY=1 TO 150:
  NEXT
10172 NEXT S:100T01618
10173 DATA "..... -- 10 PTS..... --
  15 PTS"
10174 DATA "..... -- 25 PTS...."
10175 DATA "
  "
12166 GOTO380
20000 REM END ROUTINES
20001 IF ME7=1 THEN 20050
20010 IF ME7=2 THEN 20070
20020 IF ME7=3 THEN 20100
20050 PRINT "YOUR SCORE WAS " ; SC "
  GOTO20200
20070 FOR D=1 TO 450:FOR DEL=1 TO 450:INEXT I:POKEC00+E(D),
  1:POKE(D),32:POKE(D),81:INEXT D
20071 FOR DEL=1 TO 2000:INEXT I:FOR S=6 TO 15:PRINT "
  "
20080 POKE36878,15:POKE36876,220:POKE36878,0
20090 POKE36879,SR:FOR TH=1 TO 300:INEXT I:100SUB60000:
  NEXT:100SUB30000:100T020200
20100 PRINT "OUT OF AMMUNITION"
20110 PRINT "YOUR SCORE WAS " ; SC "
20200 PRINT "PRESS SPACE FOR
  ANOTHER GAME"
20210 GETA:IF A<=" " THEN 20210
22020 GOTO380
30000 PRINT "YOU HAVE BEEN SUCKED
  INTO A BLACK HOLE" : RETURN
50000 C00=33792:J1=4118:J2=38372:S=4371:
  J3=4580:J4=4556:J5=4141:J6=4096
50010 RETURN
60000 FORA=1 TO 10
60010 B=INT(RND(1)*506)+J6
60020 C=INT(RND(1)*255)+1
60030 POKEB,C:IFORD=1 TO 50:INEXT I:PRINT "
  " : NEXT
  RETURN

```

**Black Hole**  
by Neil Eckersley

# Open Forum

## Moon Lander

on BBC Micro

In this version of "Lunar Lander", for the Model A, you are the pilot of a descending moon shuttle, low on fuel and desperate to land. The landing pad is clearly defined

and is at the bottom of a precipitous valley. "Z" and "X" control horizontal drift and "." controls descent rate. Time, fuel and drift are displayed at the top of the screen. An added difficulty is that drift has to be less than +/-5 to avoid total annihilation on landing.

The combination of mode 5's colour and graphics is used to its full. VDU 23 ... is

used to define the space shuttle and remove the omni-present flashing cursor. VDU 5 allows text to be used in graphics mode with high resolution manoeuvrability.

This means the shuttle can move one row of pixels at a time. Sound effects are incorporated in the listing and Rule Britannia is played after a successful landing.

```
10 REM*****
20 REM** MOON LANDER **
30 REM** (C)P.D. 1982**
40 REM*****
50 X$="M O O N L A N D E R":MODE7:VDU23;B202:0;0;0;PRINTTAB(7,10);CHR#
&B2;CHR#141;X$;
60 PRINTTAB(7,11);CHR#&B2;CHR#141;X$;TAB(4,16);"Z=LEFT JET: X=RIGHT JET:
.=ROCKETS"
70 PRINTTAB(3,19);"MAXIMUM VELOCITY WHEN LANDING=5";TAB(4,23);"Press the
SPACEBAR to continue";REPEATUNTILGET=32
80 MODE5:VDU23;B202:0;0;0;VDU5:DNERORRUR
90 VDU19,3,6,0,0,0
100 GCOL0,3;FORX=0TO40:PL0T&9,RND(1280),RND(400)+510:NEXT:SCOL0,2
110 MOVE=200,0;MOVE500,0;PL0T&5,100,700;MOVE300,200;MOVE400,50;PL0T&5,35
0,400;MOVE100,500;MOVE250,400;PL0T&5,220,720
120 MOVE780,0;MOVE1480,0;PL0T&5,1180,740;MOVE1000,0;MOVE780,0;PL0T&5,900
,600
130 MOVE900,200;MOVE1280,200;PL0T&5,RND(50)+550,RND(30)+560;MOVE500,0;MO
VE300,100;PL0T&5,RND(100)+500,RND(35)+400
140 VDU23,255,0,0,0,0,255,255,255,255
150 VDU23,226,126,129,153,165,165,153,129,126;VDU23,227,24,60,126,126,12
6,126,90,24;VDU23,228,0,0,60,0,60,0,0,0
160 VDU23,225,60,126,90,126,255,153,18
170 VDU23,240,16,32,64,255,255,64,32,16;VDU23,241,8,4,2,255,255,2,4,8,;V
DU23,242,24,24,24,24,153,90,60,24
180 GCOL0,1;MOVE548,32;PRINTCHR#255;CHR#255;
190 SCOL0,3;MOVE0,910;DRAW1280,910
200 X=RND(1000):Y=RND(200)+700:FU=250
210 #FX11,1
220 #FX12,1
230 VV=0;HV=RND(20)-10
240 AS=INKEY$(0):VV=VV+1:F=0;J=0
250 VDU41;PRINTTAB(0,0);CHR#240;CHR#241;" "TAB(10,0);CHR#242;" "TA
B(15,0);"F="TAB(0,2);"B="TAB(10,2);
260 PRINT"H="TAB(2,2);(-640-(X+32));TAB(12,2);Y;TAB(2,0);HV;TAB(17
,0);FU;VDU5
270 #FX15,0
280 GCOL0,0;MOVEX,Y;PRINTCHR#225;
290 IFFU<0:FU=0;GOTO330
300 IFAS="Z" HV=HV+1;J=-1:FU=FU-1
310 IFAS="X" HV=HV-1;J=1:FU=FU-1
320 IFAS="."VV=VV-4:F=1:FU=FU-3
330 VDU41;PRINTTAB(11,0);VV;VDU
340 Y=Y-VV;X=X+HV;IFY>900:Y=900
350 IFFPOINT(X,Y-32)=2 OR POINT(X+B,Y)=2 OR POINT(X+16,Y-32)=2 OR POINT(X
+24,Y-32)=2:PROCCRASH
360 IFFPOINT(X+24,Y-32)=2 OR POINT(X+32,Y-32)=2 OR POINT(X+40,Y-32)=2 OR
POINT(X+48,Y)=2 OR POINT(X+56,Y-32)=2:PROCCRASH
370 IFABS(640-(X+32))<40 AND POINT(X+32,Y-32)=1:PROCLAND
380 IFY<16:PROCCRASH
390 GCOL0,3;MOVEX,Y;PRINTCHR#225;
400 IFF=1 AND Y>80:SOUND4,-15,6,10;GCOL0,1;MOVEX,Y-32;PRINTCHR#227;
410 IFJ=1 GCOL0,1;MOVEX+64,Y;PRINTCHR#228;:SOUND4,-15,12,10
420 IFJ=-1 GCOL0,1;MOVEX-64,Y;PRINTCHR#228;:SOUND4,-15,12,10
430 IFF=1 AND Y>80 GCOL0,0;MOVEX,Y-32;PRINTCHR#227;
440 IFJ=1 GCOL0,0;MOVEX+64,Y;PRINTCHR#228;
450 IFJ=-1 GCOL0,0;MOVEX-64,Y;PRINTCHR#228;
460 GOTO240
470 DEF PROCCRASH
480 FORP=0 TO 255 STEP 7:SOUND43,-15,P,2:NEXT:SOUND4,-15,6,20
```

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```

490 GOTO 1:MOVEX,Y:PRINTCHR$226;
500 FORX=1TO6:VDU19,1,X,0,0,0:NEXT:GOTO500
510 DEF PROC LAND
520 IF VV>5 PROC CRASH
530 GOTO 3:MOVEX,Y:PRINTCHR$226;
540 FORS=1TO11:READP,D
550 IFP=999 L=0 ELSE L=-15
560 SOUND1,L,P,D: SOUND1,0,0,3:NEXT
570 GOTO570
580 DATA97,15,97,5,101,5,101,5,999,5,97,5,101,10,97,2,89,5,81,5,77,10

```

**Moon Lander**  
by Paul Driscoll

## Patterns

on BBC Micro

This program is loosely based on the random number feature of the BBC Micro. It uses high resolution graphics as well as unique sound effects. To end this program it will be necessary to press the escape key. The patterns are built up entirely of straight lines and have a range of seven different colours.

```

10 REM *****
20 REM *****
30 REM *****
40 REM *****
50 REM ***** PATTERNS *****
60 REM *****
70 REM ***** OY *****
80 REM *****
90 REM ***** MATTHEW *****
100 REM *****
110 REM ***** KEELING *****
120 REM *****
130 REM *****
140 REM *****
150 REM *****

```

```

160 T = 0
170 IN FRANK GOTO 490
180 S = 0
190 MODE ?
200 PRINT "SPC8000" TYPE IN ONE LETTER TO START THE
    PATTERN GENERATOR
210 FOR I=1 TO 10
220 IF T = 0
230 LET S = 1280
240 GOTO 240
250 LET T = 1
260 FOR J=1 TO 10:FOR K=0 TO 19:LET S=0
270 LET R = 0
280 IF T = 0
290 LET C = 1280
300 LET T = 1
310 LET R = 1280
320 LET R = 1280
330 MOVE 1280,0
340 LET X = R + V
350 SOUND 3,-15,5,1: SOUND 2,-5,150-5:1
360 IF S < 0 T = 0
370 IF S > 180 T = 1
380 IF T = 0 S = S + 4 ELSE S = S - 4
390 LET D = R + V
400 LET C = C - 1V/1000*1280
410 LET D = D - 1V/1000*1280
420 DRAW D,X
430 MOVE 0,0
440 DRAW 1280,0
450 MOVE 0,1000
460 DRAW 1280,C
470 MOVE 1280,1000
480 DRAW 0,0
490 IF X < 1024 GOTO 330
500 SOUND 1,-15,5:1
510 S = S + 1
520 GOTO 400
530 TIME = 0
540 REPEAT
550 SOUND 1,-15,5:1
560 IF T = 1 S = S - 1 ELSE S = S + 1
570 IF S > 180 T = 1
580 IF S < 0 T = 0
590 UNTIL TIME > 200
600 S = 0
610 GOTO 190
620 MODE ?
630 PRINTAB (0,33)**
640 INPUT "DO YOU WANT ANOTHER COPE?"
650 IF S = 0 OR G1 = YES* GOTO 190
660 IF S = 0 OR G1 = NO* GOTO 190
670 END

```

**Patterns**  
by Matthew Keeling

A GREAT NEW COMPETITION WORTH £THOUSANDS TO THE WINNER

## Whizz-Kid '82

Fancy your chances?

We're looking for a bright young thing who can out-shine all the commercial software houses and come up with a sparkling new program that can be marketed commercially. We want you to prove you can write a selling program and if you win the competition you'll be well on the way to making big money. The winner will receive:

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Entries to the award scheme must be accompanied by at least four out of five of the numbered coupons published in *Popular Computing Weekly* throughout September. The closing date for the competition is October 18. The winning entry will be announced in the issue published on November 18.

### Rules

1. There is no limit on the number of entries you can send in, but each entry must be accompanied by four differently numbered competition coupons.
2. Closing date for entries is October 18, 1982.
3. The names of the winners will be announced in the November 18 issue of *Popular Computing Weekly*.
4. The Judges' decision is final.
5. No employees of Sunshine Publications Ltd. or their families, will be eligible to enter the competition.

The winner will be the author who submits the most commercially viable program together with a written outline of the author's own proposals on how he would run his software house and why he would like to do it. The judge will be *Popular Computing Weekly* editor, Brendon Gore.

If a number of equally good and commercially viable programs are submitted the decision of the overall winner will be based on the best accompanying written outline of the author's proposals for running a software house.



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Fill in this coupon. When you have collected four differently numbered coupons, send them with your program to: *Popular Computing Weekly*, Whizz-Kid '82, Hobbhouse Court, 15 Whitcomb Street, London WC2.

NAME: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



which does the translation at the same time as running the program. There are speed advantages to the NewBrain's approach, but as, unlike most compilers, this one is interactive, it means that the lay user is unlikely to be aware of any difference.

The error messages, in my view, belong to another era. They are numbers, nearly 200 of them. I have never felt that the traditional Syntax error was an adequate response. Many newer computers, not just the BBC's, have improved their messages to the user. I know that full error messages take up valuable memory, but Error 21 and its relatives are hardly going to appeal to the first-time computer tyro.



The NewBrain really is a most extraordinary combination of crude and ultra-sophisticated features. So how, finally, does it compare with Acorn's BBC micro-computer? I think it is clear that it is by no stretch of the imagination suitable for the beginner. Not having colour and sound, its appeal to the home user will be limited, although games will undoubtedly be written for it.

What the NewBrain's designers have succeeded in creating is a kind of professional's ZX. The operating system's power will make it very attractive to software writers producing dedicated applications, and particularly those which require the use of advanced graphics. It will, of course, be configured to run CP/M when it gets its disc drives, and then a whole world of spreadsheets and similar packages will become available to it.

While the NewBrain is, strictly speaking, portable, its potential is somewhat diminished by the heavy separate power supply and the limited lifespan of its batteries. Its communication facilities are good, so there is a role for it as a peripatetic intelligent terminal, speaking to its host machine via a modem down the telephone lines. As a word processor, the keyboard lets it down, but as a data-capture terminal it is nearly ideal.

But for a machine of this level of sophistication, its price is remarkably low — £199 + VAT for the basic version. This in itself represents a considerable achievement on the part of its designers.

As a challenge to the enthusiast or the professional, I have no doubts about its future popularity. Who would want one? I would. There is plenty of room in the market both for machines like this one and like the one Acorn built for the BBC.

# Spectrum

In this slot various contributors explore different aspects of the ZX Spectrum

## Topping up characters by redefinition

*Geoff Wilkins presents a routine to redefine the Spectrum keyboard.*

How many user-defined characters can you create on a Spectrum? The Spectrum manual tells you how to make up to 21, using the user graphics included in the character-set, codes 144 to 164. But there are far more exciting possibilities using the system variable Chars, with the help of which you can redefine up to 96 characters — the whole of the keyboard between the space-character and the copyright symbol.

What you have to do is: 1) copy the data for characters in the Rom into an area of Ram; 2) alter Chars so that, instead of pointing to the Rom character-set, it points to the copy in Ram; 3) redefine the data of the Ram set as how you like.

The following program copies the character-set, which starts at address 15616 in the Rom, to an area above Ramtop in the Ram starting at address 31744. It then pokes a new value, 123, into address 23607 (the second byte of Chars), thus giving Chars the value of 31488 (123 times 256) instead of the usual 15360 (60 times 256) — this being 256 less than the beginning of the character-set. Next, the program redefines whichever character-key you input, using eight numbers per character precisely as the manual describes redefinition of user graphics:

```
10 CLEAR 31743 : FOR A=15616 TO 16383 : POKE
A+16128,PEEK A : NEXT A
20 POKE 23607,123
30 CLS : INPUT "CHARACTER-KEY TO BE RE-
DEFINED", K5 : IF K5<" " OR K5<"~" THEN GO
TO 30
40 LET P=31744+(CODE K5-32)*8
50 FOR N=0 TO 7 : INPUT "BINARY-DATA NUM-
BER FOR LINE:(N+1), B : POKE P+N,B : NEXT
N
60 PRINT "NEW CHARACTER: "; K5 : "PRESS
SPACE-KEY TO REDEFINE" : "ANOTHER
CHARACTER, ANY OTHER" : " KEY TO BREAK"
70 IF INKEY$<" " THEN GO TO 70
80 PAUSE 0.1 : IF INKEY$<" " THEN GO TO 30
90 CLS
```

Try running this, inputting capital "P" for

the character to be redefined, and the numbers 1, 3, 7, 15, 31, 63, 127, 255, for the data for the new character's eight lines. You will find that capital "P" has been redefined into a triangular graphic, even when it occurs in keywords like Print and Poke. The effect on some keywords after you have redefined a number of capitals can be quite bizarre, so you may prefer to stick to lower-case characters, but the keywords continue to work as normal, whatever their appearance.

Anyway, you can always return to the normal Rom character-set by the command: Poke 23607,60 — and Poke 23607,123 will take you back again to the new Ram set.

You can have a lot of fun just playing around with this program. Chapter 14 of the Spectrum manual explains the effect of different numbers on the new character's eight lines. You can enter them in the form BIN 01000111 or as decimal-notation numbers.

You can use the program to create a new keyboard for, say, the Greek alphabet, including accents and breathings, or Punjabi characters, or whatever. The new character-set is easily saved onto tape by:

```
SAVE "CHARS" CODE 31744,768
and loaded again by:
CLEAR 31743 : LOAD "CHARS" CODE 31744 :
POKE 23607,123
```

Do not forget, every time you run the program from line 10 you will wipe out any newly defined characters by copying the normal Spectrum set back into the Ram again. You can avoid this by running from line 20 or 30.

## Ant Hurron shows you how to play a little night music.

This little program enables you to use the Spectrum as a synthesiser, playing notes as you enter them using keys 0 to 9. Hook your machine up to the amplifier of your Hi-Fi and pretend you are Depeche Mode or the Human League.

The program first asks you to enter your note length — try starting with 0.05. You can change line 40 to play in different octaves if you wish. See you in the Top 10.

### LIST

```
5 REM SYNTHESISER*****ANT HU
RRION
10 PRINT "NOTE LENGTH ?": INPUT
L:CLS
20 IF INKEY$="" THEN GOTO 20
30 LET N=(CODE INKEY$)-48:REM
N IS THEN MIDDLE C
40 BEEP L,N+24:REM THE NUMBER
ADDED TO N DETERMINES OUR C
TAVE,TRY N+12,N+36,ETC
50 GOTO 20
```

# Programming

## New solution for line deletion

*Jeremy Ruston explains how to insert and delete lines on screen.*

Recently I wrote an elementary word-processing program for the BBC computer. Part of the program offered on screen text editing, for which I needed routines to insert and delete characters and lines on the screen. The simplest way to insert and delete characters is to reprint the line on which the change is to be made. However, my solution to the problem of inserting and deleting whole lines from the display has considerably wider application.

This program demonstrates the procedures "insert" and "delete" by printing a screenful of coloured letters and then alternately opening up and deleting a line which contains the words "Happy Christmas".

Both procedures are called with three parameters. The first specifies which line of the screen is to be deleted, or where a line is to be inserted. The next parameter is one less than the number of lines per screen in the current mode and the last parameter is the number of characters per line in the current mode.

Lines 250 and 260 save the current cursor co-ordinates in X% and Y% so that the cursor can be restored at the end of the operation. Line 270 sets up a text window to stretch from the line that is to be inserted to the bottom of the screen. Line 280 moves the cursor to the top left of this window and line 290 moves the cursor one line up.

Since the cursor is already at the top of the current window, the operating system scrolls the window down, creating a blank line at the point where the insertion is required. Line 300 then destroys the window.

Line 310 increments the cursor's Y co-ordinate to ensure that the cursor is in the correct position in relation to the text on the screen. Line 320 moves the cursor to the required position before line 330 exits the procedure.

PROCDelete operates in the same manner, except that the window is scrolled up, by positioning the cursor on the bottom line of the window and printing a line feed code.

Both these routines may have to be altered to fit your application. For example, it may be better for you to move all the text above a deletion down a line, rather than vice-versa. It is also possible to run all the VDU statements in the routines into one very long statement. If you do not need to restore the cursor to its old position, you could cram each routine into a single line, dispensing with the procedures altogether.

### LIST

```
10 REM -----
20 REM   Insert and delete line
30 REM   Copyright (C) 1982
40 REM   Jeremy Ruston
50 REM -----
60 MODE 7
70 VDU 23:8202:0:0:0:
80 FOR TX=0 TO 23
90 VDU 31,0,TX
100 PRINT CHR$(128+RND(5));STRING$(38,
CHR$(65+TX))
110 NEXT TX
120 REPEAT
130 TIME=0
140 REPEAT UNTIL TIME>30
150 PROCinsert(10,39,24)
160 PRINT TAB(0,10);" Happy Christmas"
170 TIME=0
180 REPEAT UNTIL TIME>30
190 PROCdelete(10,39,24)
200 UNTIL FALSE
210 END
220 REM -----
230 DEF PROCinsert(L%,R%,B%)
240 LOCAL X%,Y%
250 X%=POS
260 Y%=VPOS
270 VDU 28,0,B%,R%,L%;REM text window
280 VDU 30 :REM home cursor
290 VDU 11 :REM cursor up
300 VDU 26 :REM no windows
310 IF Y%>L% THEN Y%=Y%+1
320 VDU 31,X%,Y% :REM cursor move
330 ENDPROC
340 REM -----
350 DEF PROCdelete(L%,R%,B%)
360 LOCAL X%,Y%
370 X%=POS
380 Y%=VPOS
390 VDU 28,0,B%,R%,L%;REM text window
400 VDU 31,0,B%-L% :REM cursor move
410 VDU 10 :REM cursor down
420 VDU 26 :REM no windows
430 IF Y%>L% THEN Y%=Y%-1
440 VDU 31,X%,Y% :REM cursor move
450 ENDPROC
460 REM -----
```

# Machine Code

Ian Stewart and Robin Jones present a new series for beginners

## Plus or minus? That is the question

Now that we've seen something about manipulating binary numbers let's return to looking at the way they are handled inside the machine. Usually, a number is held in a fixed number of bits, often 16 or 24 or 32, depending on the machine design. This number of bits is called the *word size* for the machine.

Let's examine what numbers could be held in a 4-bit word:

4-bit pattern	Decimal value
0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	10
1011	11
1100	12
1101	13
1110	14
1111	15

It's obvious why bigger word sizes are chosen in practice — a machine which can only represent the numbers 0 to 15 is unlikely to be adequate. But, there are two other problems. The notation can't represent fractional values (7.14, for instance) and it can't represent negative numbers.

We'll ignore the fractions problem, because most machine code routines only use integers, but in ways in which negative numbers are dealt with is more pressing.

The technique is simple. If you've got the binary representation of a positive number and you want to create its negative equivalent you do two things:

1. Change all the 0s to 1s and all the 1s to 0s (this is rather picturesquely called "flipping the bits").
2. Add 1 to the result.

For instance, suppose you want -3:

```
3 = 0011 in a 4-bit word
Flipping the bits gives: 1100
Now add 1:           1101
```

So 1101 represents -3. It's called the 2's complement of 0011.

We are not going to explain exactly why this works, but you can prove to yourself that it does in any particular case like this:

If you add 3 to -3 (or 5 to -5 or anything to minus itself) you should get zero. So:

```
0011    (-3)
+ 1101  (-=-3)
-----
```

```
10000
```

```
111
```

(Don't forget that 1+1=0 carry 1 in binary)

So we don't get 0000 at all. But the junior 4 bits are zero, and if you are working in a 4-bit word the senior bit will just drop off the end. (For a convenient analogy, think about a car trip-meter with 3 digits — if it reads 999 and you drive an extra mile, it reads 000 and a "1" has "dropped off" the left-hand end.)

In other words we should have seen it like this:

```
  0011
+ 1100
-----
  0000
```

This always works, provided that the number of bits is fixed throughout. Don't forget to include leading zeroes to make up the number of bits to this standard length, before taking the 2's complement.

Let's rewrite the 4-bit table of values, now including negatives:

Decimal	Binary	2's complement	Decimal
0	0000	0000	0
1	0001	1111	-1
2	0010	1110	-2
3	0011	1101	-3
4	0100	1100	-4
5	0101	1011	-5
6	0110	1010	-6
7	0111	1001	-7
8	1000	0000	-8
9	1001	0111	-9
10	1010	0110	-10
11	1011	0101	-11
12	1100	0100	-12
13	1101	0011	-13
14	1110	0010	-14
15	1111	0001	-15

Straight away you can see that there's a problem. Every bit-pattern occurs twice so that, for instance, 1001 could mean 9 or -7. So we'll have to restrict the range of values still further.

We have drawn a dotted line around the region we actually choose to represent. If you look at the senior (leftmost) bit in each of the patterns you'll notice that it's "0" if the number is positive and "1" if the number is negative. This is obviously a very convenient distinction.

So the range of numbers we can get into a 4-bit word is -8 to +7. For 5 bits it would be -16 to +15. For 6 bits it will be -32 to +31 and so on. A 16-bit word (which is important so far as the Z80 is concerned) holds the range -32768 to +32767.

We have now dealt with positive and negative numbers. Next week we will look at how the machine crunches them. To do this, we need to understand the internal structure of the processor — its architecture.

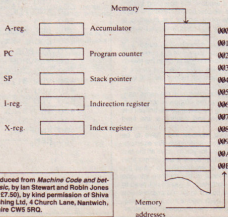
The Z80 processor is the product of some 25 years of computer development and is a fairly sophisticated beast. So it's not really a good place for the beginner to start. What we are going to do, then, is describe a simple processor, just to introduce the important concepts which are relevant to virtually all current devices.

We will suppose that our imaginary machine has a memory of 16-bit words and a number of 16-bit special-purpose registers as shown below:

### Machine Architecture

Let's look at the memory first. In Basic we could have called each of those memory locations anything we fancied, but the naked machine isn't so friendly. It insists on numbering every location in an absolutely fixed way, starting at zero. These numbers are called the *memory address*. We have numbered them in hex, although you should always bear in mind that, ultimately, the coding will be in binary.

To be continued next week.



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# Peek & poke

Peek your problems to our address. Ian Beardsmore will poke back an answer.

## STACKING THE DECKS HIGH

S Wilkinson of Holcroft Road, Kingswinford, East Midlands, writes:

**Q** I ordered a ZX Spectrum about six weeks ago. While I am waiting, I would like to try writing a program, or at least re-write a program, for it. I want to do D K Allen's pontoon program, but I have a problem. Could you please give me the configuration for Hearts, Clubs, Diamonds and Spades. Please put them in binary form.

**A** This in fact is simple to do. All you need is an 8 x 8 grid. A nought is used for the spaces, and a one for the shaded areas. I have given their decimal numbers as well.

(Hearts)	(Clubs)
00100010 34	00001000 - 8
01110111 119	00011100 28
01111111 127	00101010 42
01111111 127	01111111 127
00111110 62	00101010 42
00011100 28	00001000 8
00001000 8	00011100 28
00000000 0	00000000 0
(Diamonds)	(Spades)
00001000 8	00001000 8
00011100 28	00011100 28
00111110 62	00111110 62
01111111 127	01111111 127
00011100 28	00111110 62
00011100 28	00001000 8
00001000 8	00011100 28
00000000 0	00000000 0

Throughout the program I have kept the first column, and the last line, at nought. This is to give space between characters on the screen.

## RAISING HIGH THE ROOFBEAM

M Ellick of 3 Burrington Close, Nailsea, Bristol, Avon, writes:

**Q** On several occasions your magazine has printed letters from readers complaining of long delivery times. What about yourselves?

On July 7 I sent a query to Peek & poke asking if the new Microdrive to be released by Sinclair would be usable with the ZX81. I put in a SAE for reply and as yet have had none. Even a "don't know" would be better than nothing.

**A** As I have said before, I cannot answer every letter personally. There are simply too many of them.

Instead, I try and pick let-

ters that reflect questions asked by a number of different readers. Your letter, which appeared in Peek & poke September 9, was similar to a number of other letters I received on the same subject. Rather than answer each letter individually, I picked one to stand for the rest.

There are two reasons for a delay in publishing letters. One is lack of space. The other is the time needed to research each query.

## A PRINTER'S PRICE

Richard Jones of Avon Crescent, Pelsall, Walsall, writes:

**Q** Could you please tell me how a ZX printer can be used with a Vic20 computer? Also could you give me a rough idea of how much it will cost. I have seen the July 1 issue of *Popular Computing Weekly* and I saw the Amber 2400 printer advertised. Could you tell me which would be more suited to the Vic?

**A** Several people have asked this, and though I have mentioned it before, a repeat will probably be useful for some readers. The company you want is 'Microtonic Software' of 235 Friern Road, Dulwich, London SE22. They do interfaces for several computers, including the Vic, BBC, AIM65 and Atom.

The printerface costs £29.95 plus 50p postage and packing. You will, of course, have to buy a ZX printer. With postage and packing you are talking of a little under £95.

The address of Amber was given in that same issue of PCW, but if you missed it here it is again: Amber Controls, Central Way, Walsworth Industrial Estate, Andover, Hants.

As to which of the two is more suited to the Vic, it is more a question of which is more suited to your pocket and your taste. The Amber will be about £20 cheaper. The paper is a standard product, unlike Sinclair's which is only available from one independent source. However, I doubt if the inked ribbon for the Amber will be available from an independent source.

From my post bag there seem to be a few problems

with the Sinclair printer, particularly with very light printing. The size of the printout on the Amber is smaller, but as long as you keep a good inking ribbon in, it will probably be clearer.

## LAWING NOT ALLOWED

Ian Morrison of Pent-y-dwr, Three Crosses, Swansea, writes:

**Q** Please could you answer some queries for me about the law on software copyright. I am thinking of starting a software library for the ZX81. I have a store of 500 programs, about 50 of which were written by myself. Could you please tell me how the law stands on lending cassettes, where:

- A) Software is on the original cassette.
- B) Software is not on the original cassette.
- C) Software is copied from a book.
- D) Software is copied from a magazine.

Could you tell me if it is illegal to sell programs taken from listings in magazines, if you credit the magazine concerned?

I am also hoping to start a service whereby people send in programs to a software pool. If a program is accepted, the author will be given access to other programs in the pool. This may sound a little ambitious, but I feel that there is not enough exchange of information between computer enthusiasts.

**A** These questions do not just concern the ZX81. They concern the whole software business. Now that a recent government green paper has 'passed the buck' back into the lap of the computer industry, it is a situation that we must sort out for ourselves, and the sooner the better.

I must point out at the start that I am not a lawyer. I will attempt to give a guide to the law as it stands at the moment, but I must stress that this is just a guide.

A lot depends on whether a software cassette is regarded as a music or video tape. The Mechanical Copyright Protection Society told me that it is not illegal to use music cassettes in a library, providing you

use the original tapes. But, the Video Copyright Protection Society told me that it is illegal to use a video tape for hire, without the manufacturer's consent.

David Paterson of Silversoft said in an interview in *Popular Computing Weekly*, September 2, that there was not much that could be done about cassette libraries. I have spoken to him since then, and he told me that he was not aware of the law concerning video cassettes. The crucial question is whether software is to be regarded as music or video. Unfortunately, the courts have yet to rule on this point.

The second two points that you raise are more easily covered. Look at the front of any book and you will most likely see the following: 'All rights reserved. No part of this publication may be reproduced, stored in any retrieval system or transmitted in any form or by any means, electronic, mechanical, or photocopying, without prior permission of the copyright owner.'

Strictly speaking, this means that you are not allowed to store computer programs found in a book on a computer. This will not apply to tapes made for your own use, but it does mean that you cannot use these programs in a library without permission: this also applies to magazines.

If you feel that you want to go ahead with your library, you should start by approaching the software manufacturers. They might agree to some sort of royalty deal, but I doubt if they would let you reproduce their programs for free.

Perhaps you might try contacting one of the other libraries that has grown up. One was apparently 'represented' at the recent Microfair, though most people I talked to did not seem to have noticed it.

Whatever happens in the next few months will need to be watched very carefully, as it will effect everyone who sells or buys software, especially games software.

Send your questions to Peek & poke, *Popular Computing Weekly*, Hobbhouse Court, 19 Whitcomb Street, London WC2 7HF.

# Classified



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**VIC20 GAMES**, graphics/sound/colour: Dragon, Helicopter, Venus Flytrap, Alien Pilot, Hunter 2, Bats 21, Card-Eyes, Hunter 1 (+ 3K) = £8. C. P. White, 27 Northfield Road, West Ealing, London W13 9SY.

**ZX81 16K TOOLKIT**, 17 m/c routines, including habitat, free memory, renumber, clear part screen, borders, etc, cassette plus instructions £3. K. Francis, 15 Northwick Road, Keston, Stamford.

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**VIC20** with extra 3K, plus cassette deck, games including Pacman, Alien, £250 ono. Ring James 348 4454.

**VIC20** with cassettes, hi-res cartridge, £60 software, four months old, £240. Bristol 621385.

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**SPECTRUM RENUMBER**, instantly renumbers all or part of program. All Gotos, Gosubs, etc. included. The first and probably the best in m/c for only £3.95. David Webb, Southmead, 9 Park Road, Woking, Surrey.

**ZX81, SINCLAIR 16K RAM**, manual, leads etc. for sale at £95. Ring Mark Chidlow on Wakefield (0924) 250286.

**BBC MICRO COMPUTER**, Model B, only £385. Tel: Cumbernauld 33142. 1 Pine Crescent, Abbrin Hill, Cumbernauld, Scotland.

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# COMPUTER SWAP 01-930 3266

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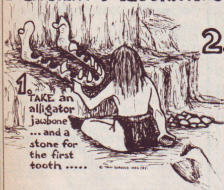
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## ANCIENT ALGORITHMS

PUZZLE NO24

by Tony Roberts



1. TAKE an alligator jawbone ... and a stone for the first tooth .....

2. IF there are no more teeth in the jawbone ... STOP.

3. FIND an extra stone for each stone you hold



4. IF the next tooth is missing ... Go to 2. otherwise pick up a new stone, add it to the others and return to 2.



Q. WHAT ARE YOU CALCULATING?

## Solution to Puzzle No 20

In the first of the Ancient Algorithms the cavewoman has been calculating the highest common factor (or as one entrant had it — highest cairn factor) of the number of stones in the original heaps via an iterative loop. In Basic the process would be represented by:

```
10 INPUT A, B
20 IF A > B THEN A = A - B ELSE B = B - A
30 IF A * B > 0 THEN 20
```

## 40 PRINT A \* B

This algorithm is known as a Euclidean algorithm for greatest common divisor by repeated subtraction. No prizes to the entrant who solved the puzzle using a packet of Opal Fruits!

## Winner of Puzzle No 20

The winners are: Heather and Michael Devine, 12 Greenhaven Rise, Llandough, Penarth, S. Glamorgan, who receive £10.

## Rules

The winner of the puzzle will be the reader who, in the opinion of *Popular Computing Weekly*, has submitted the best solution. Preference will be given to solutions which show how the entrant arrived at the correct answer. Envelopes containing entries should be clearly marked 'PUZZLE'. The closing date for the competition is Tuesday October 5. The judges' decision is final.

VIN AUTOMATIQUE

A.R.T.H.U.R.

Lawrence Lerner & John Macdonald  
Designed by THE ARTS DESIGN GROUP

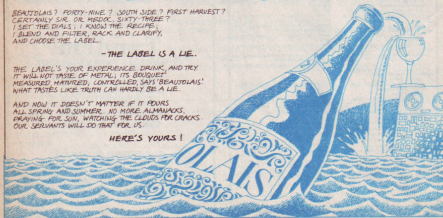
BEAUTOLAIS? FORTY-NINE? SOUTH SIDE? FIRST HARVEST?  
CERTAINLY SIR. OR MIDOC, SIXTY-THREE?  
I SET THE DIALS; I KNOW THE RECIPES;  
I BLEND AND FILTER, RACK AND CLARIFY,  
AND CHOOSE THE LABEL.

-THE LABEL IS A LIE.

THE LABEL'S YOUR EXPERIENCE DRINK, AND TRY  
IT WILL NOT TASTE OF METAL; ITS BOUQUET  
MEASURED, MATURED, CONTROLLED, SAYS 'BEAUTOLAIS'  
WHAT TASTES LIKE TRUTH CAN HARDLY BE A LIE.

AND NOW IT DOESN'T MATTER IF IT POURS  
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